

Final Time Critical Soil Sampling Work Plan

Post Removal Action Soil Sampling Small Arms Complex Open Burn/Open Detonation River Site, Fort Wainwright, Alaska

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Prepared for

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LIST OF ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
ALS	ALS Environmental
CD	compact disk
CDQR	chemical data quality report
COC	contaminant of concern
CFR	Code of Federal Regulations
CRREL	Cold Regions Research and Engineering Laboratory
DQO	data quality objective
DRO	diesel range organics
DU	decision unit
ELAP	Environmental Laboratory Accreditation Program
EM	electromagnetic
EOD	Explosive Ordnance Disposal
EPA	U.S. Environmental Protection Agency
FES	Fairbanks Environmental Services
ft ²	square feet
GPR	ground penetrating radar
GPS	global positioning system
GRO	gasoline range organics
HE	High Explosive
H&S	Health and Safety
IDW	Investigation-Derived Waste
ITRC	Interstate Technology Regulatory Council
Jacobs	Jacobs Engineering Group Inc.
LocID	location identification
LOD	limit of detection
LOQ	limit of quantitation
MEC	munitions and explosives of concern
MD	munitions debris
mg/kg	milligram per kilogram
mg/L	milligrams per liter
MI	Multi-Incremental
ml	milliliter
MPPEH	material potentially presenting an explosive hazard
MS/MSD	Matrix Spike/Matrix Spike Duplicate
OB/OD	Open Burn/Open Detonation
oz	ounce
PD	Point Detonating
PID	photoionization detector instrument

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

QA/QC	Quality Assurance/Quality Control
QSM	Quality System Manual for Environmental Laboratories
RCRA	Resource Conservation and Recovery Act
RPD	relative percent difference
RSD	relative standard deviation
RSLs	regional screening levels
sf	square feet
SOP	standard operating procedure
SSWP	Soil Sampling Work Plan
SVOC	semivolatile organic compounds
TCLP	toxicity characteristic leaching procedure
TCRA	Time Critical Removal Action
THQ	target hazard quotient
UCL	Upper Confidence Level
UFP-QAPP	Uniform Federal Policy for Quality Assurance Project Plan
USACE	U.S. Army Corps of Engineers
USAGAK	U.S. Army Garrison, Alaska
USARAK	U.S. Army Corps of Engineers, Alaska District
UXO	Unexploded Ordnance
VOA	volatile organic analysis
VOC	volatile organic compound
VT	Variable Time

1.0 INTRODUCTION

This Soil Sampling Work Plan (SSWP) was prepared to direct sampling activities following a Time Critical Removal Action (TCRA) at the Open Burn/Open Detonation (OB/OD) River Site (CC-FTWW-068). The removal action is scheduled to be completed near the end of May 2016 and soil sampling will need to be completed immediately following the removal action. For safety, munitions debris (MD) will be removed from the site prior to this soil sampling effort and unexploded ordnance (UXO) experts that performed the removal action work will be onsite during the sampling effort. The site is located within the active Small Arms Range Complex on Fort Wainwright in Fairbanks, Alaska.

Soil samples will be collected and analyzed to determine if soil contamination remains following the removal action. Soil samples will be collected from the area where the removal action occurred, and from the stockpiled soil that was excavated during the removal action.

The SSWP summarizes the proposed field sampling and reporting efforts. The field activities in this plan will be performed in spring/summer 2016 immediately following completion of the TCRA. Fairbanks Environmental Services (FES) is providing these services to the U.S. Army Corps of Engineers (USACE) under contract number W911KB-12-D-0001, Task Order 30.

1.1 Site Background and Physical Settings

1.1.1 Background

An illegal civilian squatter encampment now called the OB/OD River Site (also referred to as the Brass Camp) was discovered within the firing fan on the Fort Wainwright Small Arms Complex (Figure 1). The Small Arms Complex is located within the Tanana Flats Training Area. The OB/OD River Site comprises an area on the northern bank of the Tanana River area. Trespassers reportedly excavated and removed small-arms brass casings from the area.

Significant quantities of MD were observed by Jacobs Engineering Group Inc. (Jacobs) during a site visit to the OB/OD River Site on June 27, 2013, with personnel from Fort Wainwright range control, U.S. Army, emergency responders, and conservation officers. The site was designated as CC-FTWW-068 and the site visit was documented in a Technical Memorandum (Jacobs, 2014).

Based on the types of MD observed, several hazard types were identified including uncontrolled detonation and flammable materials. The MD also has the potential for

environmental contamination. Historic air photographs show that the Tanana River is eroding the bank adjacent the OB/OD River Site and a historic burn trench may extend into the river.

1.1.2 Site Location and Use

The site is located along the northern bank of the Tanana River within the firing fans from the Small Arms Range Complex. The 5,053 acre Small Arms Range Complex is still in use and is part of the Fort Wainwright Range Complex Tanana Flats Training Area, which encompasses over 622,000 acres. The Small Arms Range Complex is located directly to the south of the Fort Wainwright cantonment area (Figure 1). The entire 622,000 acre area is designated as a Dud-Impact Area which means there is a potential to encounter UXO anywhere within these boundaries. The Fort Wainwright Range Complex Tanana Flats Training Area is still active and there are no plans for any changes to the current land use in the immediate or distant future.

1.1.3 Summary of Previous Site Work

Geophysical Survey

In February 2015 the Cold Regions Research and Engineering Laboratory (CRREL) performed a geophysical site evaluation of the site. Electromagnetic (EM) time domain metal detector and ground penetrating radar (GPR) were used across the 2 acre study area. The purpose of the study was to use non-invasive geophysical methods to delineate the extent of surface and buried munitions debris within a former historical military munitions burial area(s) and to identify any locations where MD has been and could be eroding into the Tanana River. Based on the CRREL site evaluation, an area of approximately 0.8 acres was found to contain surficial and subsurface ferrous and non-ferrous MD. Geophysics identified subsurface anomalies that are believed to consist of concentrations of brass casings, ferrous, and non-ferrous MD (Figure 2). Two features were identified that appeared to areas where MD had been removed by trespassers. These features consisting of an excavated depression and a trench that runs northeast from the river (Figure 2).

Fall 2015 TCRA

The 2015 TCRA was focused on the terrestrial 16,600 square feet (ft²) area that the CRREL geophysical survey identified buried debris as shown in Figure 2 (areas with elevated electromagnetic responses). The site was cleared of vegetation to allow surface and subsurface clearance of the MD. Removal actions were performed by USACE UXO experts to remove MD, potential munitions and explosives of concern (MEC), and material potentially presenting an explosive hazard (MPPEH). Removal actions were performed in August/September 2015 and were interrupted by freezing

conditions. An aerial image of the site during the 2015 TCRA effort (September 7, 2015) is included as Figure 3.

Over 300,000 pounds of metal was recovered/recycled and approximately 2,500 cubic yards of soil has been stockpiled in varying stages of processing (U.S. Army Garrison, Alaska [USAGAK], 2015a and 2015b). In addition, the following MEC items were transferred to Explosive Ordnance Disposal (EOD) on September 28, 2015, and were subsequently destroyed:

- 5 – M48 Series Point Detonating (PD) fuzes
- 16 – M108 100 pound series bomb fuzes
- 9 – Rifle grenade star clusters
- 13 – M728 Variable Time (VT) fuzes
- 20 – 2-pound incendiary bombs
- 1 – M103 bomb tail fuze
- 4 – 105mm HE (High Explosive) (2 partials and 2 complete but unfazed)
- 13 – 10-pound incendiary bombs with fuze dome still in place
- 63 – M101A1 tail fuzes
- 8 – M151 tail fuzes

March 2016 TCRA

The March 2016 field effort was focused on the excavation and removal of MD identified in Tanana River sediments and was performed when the river surface was frozen (to allow access with heavy equipment). Approximately 500 cubic yards of material was removed and placed in a stockpile for future screening and processing.

May/June 2016 TCRA

An additional removal action effort is scheduled to start in late May or early June 2016 to complete the TCRA. The existing stockpiles will be processed, and the site will be re-surveyed for MD.

1.2 Field Activities

Table 1-1 summarizes field activities to be performed at the OB/OD River site. Note that field activities will only be performed after the removal action and confirmation geophysics have documented that the site (or portion of the site that is being sampled) is clear of anomalies. Both multi-incremental and discrete soil samples will be collected during the field effort to assess munitions and petroleum constituents, respectively.

Table 1-1 Field Activities

Activity	Task Description
Soil Sampling	<ul style="list-style-type: none"> Multi-incremental soil samples will be collected from 6 terrestrial decision units and 3 stockpiles and analyzed for Munitions Constituents. All primary MI sample locations within the trenches and associated stockpile(s) will be field screened for volatile organics, and 5 discreet samples from each trench/stockpile will be collected from the locations with the highest screening results for laboratory analysis of Petroleum Constituents. Areas outside the trenches will also be evaluated for potential petroleum contamination; field screening samples will be collected from any MI sample cells having evidence of soil contamination and up to 5 additional discrete soil samples will be submitted for laboratory analysis of Petroleum Constituents.
GPS Surveying	<ul style="list-style-type: none"> Survey discrete sample locations and MI decision unit boundaries.

GPS – global positioning system

1.3 Project Organization and Responsibilities

The FES Project Manager will maintain overall responsibility for the project. Sampling will be performed by a qualified environmental professional, or ADEC qualified samplers under direct supervision of the qualified environmental professional, as required by Title 18 of the Alaska Administrative Code, Chapter 75.333 (18 AAC 75.333). Table 1-2 identifies key project individuals and their responsibilities.

Table 1-2 Project Organization and Key Personnel Responsibilities

Name	Title	Organization	Responsibility
Brian Adams	Program Manager	Fort Wainwright	Overall responsibility of Restoration Program at Fort Wainwright.
Bob Glascott	Project Manager	USACE	Overall responsibility of project.
Bob Hazlett	Technical Lead	USACE	Oversight of the contractor.
Mike Utley	Project Chemist	USACE	Evaluation of munitions present and determination of potential munitions constituents. Oversight of laboratory data quality.
Bryan Johnson	Project Manager	FES	Responsible for field efforts and reporting.
Mike Boese	Project Chemist and QA Officer	FES	Perform field oversight of sample collection. Evaluate laboratory data and deliverables for quality and usability.
Chris Boese	H&S Officer	FES	Ensures that personnel adhere to H&S plan.

H&S – Health and Safety; QA – Quality Assurance

1.4 Project Schedule and Tasks

The proposed schedule for project activities is briefly described in Table 1-3.

Table 1-3 Schedule of Activities

Activity/Tasks	Tentative Completion
Prepare Draft Final Soil Sampling Work Plan	May 20 , 2016
Review Comments (Draft Soil Sampling Work Plan)	June 10, 2016
Prepare Final Soil Sampling Work Plan	June 29, 2016
Complete Removal Action	July 15, 2016
Soil Sampling ^a	July 15-20, 2016
Laboratory Report	August 22, 2016
Prepare Draft Report	September 30, 2016
Review Comments (Draft Report)	October 30, 2016
Comment Resolution Meeting	To be determined
Prepare Final Report	November 30, 2016

^a – Field sampling will be performed after the MD removal action is completed.

2.0 SOIL SAMPLING

This section presents the soil sampling activities that will be conducted at the Tanana River OB/OD site following the MD removal effort. The work performed will be in accordance with this Work Plan, the Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP) which was included in the Postwide Work Plan for sites on Fort Wainwright (FES, 2016), and the Field Guidance Document (ADEC, 2016b).

The MEC found during the 2015 removal actions and the associated constituents are summarized in Table A1 (Appendix A). Sampling is described in more detail in the FES standard operating procedures included in Appendix B.

2.1 Soil Sampling Project Objectives and Approach

The overall project objective is to determine if soil contamination remains following the removal actions (i.e., verify whether the TCRA has accomplished the goal of removing immediate soil risk to human health and the environment). Stockpile samples will also be analyzed for Resource Conservation and Recovery Act (RCRA) toxicity characteristics for determining disposal options. Both multi-incremental (MI) and discrete samples will be collected as described below. MI samples will be analyzed for munitions constituents and discrete samples will be analyzed for petroleum as described in Sections 2.2 and 2.3, respectively.

Sample results will be compared to default Alaska Department of Environmental Conservation (ADEC) soil cleanup levels (the most conservative ADEC cleanup levels from Tables B1 and B2 of 18 AAC 75 [ADEC, 2016]), background metal concentrations (where applicable), and U.S. Environmental Protection Agency (EPA) regional screening levels (RSLs). The RSLs from the EPA RSL table (EPA, 2015) are based on a carcinogenic risk level of 1×10^{-6} and a noncarcinogenic target hazard quotient (THQ) of 0.1. Several metals (arsenic, barium, cadmium, chromium, and lead) will be compared to background metal concentrations established for south of the Chena River on Fort Wainwright (U.S. Army Corps of Engineers, Alaska District [USARAK], 1994). Toxicity characteristic leaching procedure (TCLP) sample results from stockpiles will also be compared to the RCRA toxicity limits. Soil sample result comparisons and data use are summarized in Table 2-1. Table E1 in Appendix E presents cleanup and screening levels that will be utilized.

Table 2-1 Soil Sample Result Comparisons and Data Use

Data	Compared to:	Use of Data
Discrete and MI Soil Sample Results (including 95% UCLs from MI samples)	ADEC Soil Cleanup Level	Determine if TCRA is complete and determine if soil stockpiles can remain onsite (versus offsite disposal).
	EPA RSL	Discussion for any detected contaminants for which ADEC cleanup levels do not exist.
	Background Metals Concentrations (Arsenic, Barium, Cadmium, Chromium, and Lead)	Determine if results are within the range of naturally occurring metals at the site.
TCLP Results (from stockpile MI samples)	RCRA Toxicity Criteria (40 CFR261.24)	Determine if stockpiled material qualifies as a hazardous waste for disposal.

CFR – Code of Federal Regulations; EPA – Environmental Protection Agency; MI – multi-incremental; RSL - regional screening levels; RCRA - Resource Conservation and Recovery Act; TCLP - Toxicity characteristic leaching procedure
TCRA - Time Critical Removal Action; UCL - upper confidence level

2.2 Multi-Incremental Soil Sampling for Munitions Constituents

MI samples will be collected to determine the concentrations of potential munitions constituents in surface soils and in stockpiled soils. MI samples will be collected from subareas that collectively cover the entire site. Additionally, MI sample will be collected from each stockpile. MI sampling results can provide an average concentration over an area or an average concentration per a specified volume.

The potential contaminants of concern (COCs) targeted for analysis were selected based on the types of MC potentially present at the site (Appendix A). MI soil samples will be analyzed for the following:

- Munitions and explosives (EPA Method 8330B)
- Metals, total (EPA Method 6010C/6020/7471)
- Perchlorate (EPA Method 6850)
- White phosphorus (EPA Method 7580)
- pH (SM 9045D)

Metals analysis will include aluminum, antimony, arsenic, barium, bismuth, cadmium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, strontium, and zinc. The metals were listed as constituents in small arms used in military ranges (CRREL, 2011). Note that hexavalent chromium was not listed as a potential MC and will not be included as an analyte.

In addition to the methods listed above, MI samples collected from stockpiles will also be analyzed for eight analytes (2,4-dinitrotoluene, nitrobenzene, arsenic, barium, cadmium, chromium, lead, and mercury) using the toxicity characteristic leaching procedure (TCLP) to determine disposal options. These analytes were chosen because they have maximum RCRA Toxicity Characteristic limits. The limits are listed in Title 49 Code of Federal Regulations (CFR)

Chapter 261.24 (49 CFR 261.24). The analytes will be extracted and analyzed by the following methods:

- TCLP Nitrobenzene and 2,4-Dinitrotoluene (EPA Method 1311/8330B)
- TCLP Arsenic, Barium, Cadmium, Chromium, Lead, and Mercury (EPA Method 1311/6020/7470)

2.2.1 MI Decision Units

MI samples will be collected from the six decision units (DUs) shown on Figure 4. Collectively, the DUs cover the 0.4 acre area exhibiting anomalies during the February 2015 geophysical survey.

DU-4 and DU-5 represent areas that exhibited the highest electromagnetic responses and were excavated during 2015 to a depth of approximately 4 to 6 feet deep. DU-3 represents an area that surrounds the trenches and DU-2 represents an area north of the trenches that also exhibited elevated electromagnetic responses. Both DU-1 and DU-6 represent areas that are on the northern and southern edge where only surface anomalies were identified. The DU boundaries identified on Figure 4 may need to be adjusted slightly to match the actual size of the excavation(s); DU boundaries will be surveyed with a global positioning system (GPS) during field efforts. Note that DU will only cover terrestrial areas.

MI samples will also be collected from soil stockpiles. Each stockpile will constitute one DU. Three stockpiles are anticipated after the TCRA has been completed. Table 2-2 summarizes the MI sampling program.

Table 2-2 Summary of Multi-Incremental Soil Sampling

Decision Unit	Depth^a	Description	Approximate Size of Decision Unit	Approximate Number of Increments^b
DU-1	0-3 inches	Northern portion of the site where only surface anomalies were noted	6,900 sf	73
DU-2	0-3 inches	Area north of trenches where elevated electromagnetic responses were measured	5,500 sf	56
DU-3	0-3 inches	Area immediately surrounding the two trenches	3,400 sf	138
DU-4	0-3 inches	Trench #2	1,300 sf	51
DU-5	0-3 inches	Trench #1	2,100 sf	84
DU-6	0-3 inches	Southern portion of the site where only surface anomalies were noted	2,400 sf	105
DU-7, 8, 9	Varies ^c	Stockpiles	Varies – estimated 2,000 cubic yards total	50

^a Depth intervals are measured below the vegetated mat, if present.

^b The size of the decision units will be adjusted based on actual site conditions. Likewise, the number of increments will also be adjusted to match site conditions. . Section 2.2.2 and 2.2.3 identify how increments will be identified.

^c Stockpiles will be sampled from various depths as described in Section 2.2.3.

sf – square feet

2.2.2 MI Sample Locations and Collection

Individual increments will be collected from pre-determined locations illustrated on Figure 5. A MI sample grid of approximately 10 feet by 10 feet will be used for DU-1, DU-2, and DU3 so that approximately 50 to 100 sample increments will be collected from each of these DUs. The smaller trench DUs (DU-4 and DU-5) and DU-6 will use a tighter sample grid (5 feet by 5 feet) so that a minimum of 50 sample increments will be collected.

As stated above, the DU boundaries are estimated in Figures 4 and 5 and may need to be adjusted slightly to match actual conditions. The size of the cells or the sample locations within the cells will not be modified, but cells will be added or subtracted based on actual site conditions.

Proposed systematic random soil sampling locations within each decision unit are shown on Figure 5. Primary sample coordinates were randomly generated:

Primary Sample Coordinates: (X,Y) where

$X = 0.5 \times \text{cell width}$

$Y = 0.8 \times \text{cell length}$

Primary sample locations within cells will be uploaded into a GPS unit and located with sub-meter accuracy in areas with sufficient satellite reception. Alternatively (and especially if satellite reception is poor), sample locations will be located by measuring the systematic random locations with a tape from known sample locations or site features. A combination of GPS and taped measurements will be used to lay out sample locations efficiently in the field. Primary sample locations from different DUs will be marked with different colored pin flags to distinguish the different DUs. Triplicate sample locations for DU-4 and DU-5 will be measured off of the primary sample locations.

Individual MI sample increments from terrestrial DUs will be collected with a driven soil probe according to the standard operating procedure (SOP) included in Appendix B. Individual increments (2-inch long plugs – approximately 30 grams each) will be retrieved from the opening on the side of the 1-inch-diameter barrel and placed in labeled containers. The increments from all the cells within a decision unit will collectively constitute a bulk sample.

MI samples from DU-4 and DU-5 will be collected in triplicate to evaluate sample precision and perform statistical analysis on the data. The additional samples also increase the chances of detecting contaminants, if present. Triplicate sample increments will be collected from one foot east and one foot south of the primary sample location from each cell as shown on the inset in Figure 5.

2.2.3 Stockpile MI Sample Locations and Collection

As mentioned in Section 2.1.1 above, each stockpile will constitute a single DU. The dimensions and quantities of stockpiles are unknown since excavation activities have not been completed. At the end of the 2015 there were 2 stockpiles totaling approximately 1,000 to 2,000 cubic yards in various stages of processing (USARAG, 2015b and 2015c). A third stockpile measuring approximately 500 cubic yards was created in March 2016 upon removal of material from Tanana River sediments; the material from that stockpile has not yet been screened for MD. Additional terrestrial excavation is planned for May 2016.

The total volume of excavated soil is estimated to be approximately 2,000 cubic yards and will likely be divided into three stockpiles. Since different munitions types were identified in the river bed versus the terrestrial ditches, stockpiles will not be mixed and will be sampled as separate decision units.

Since the size and quantity of stockpiles have not been determined, the sampling procedures listed below are general. The sample grid will be adjusted accordingly so that approximately 50 increments will be collected from 50 cells in each stockpile DU regardless of size.

Prior to sampling, each stockpile will be reconfigured to facilitate sample collection. Each stockpile will be spread out using heavy equipment so that piles will have a fairly uniform height of between 2 to 5 feet, to allow representative sampling. Once each stockpile is flattened, the area will be measured and a grid containing roughly 50 cells with equal size will be overlain. The areas of the flattened stockpiles are estimated to be approximately 2,500 to 8,000 square feet, so each MI cell will be roughly 50 square feet to 160 square feet in size.

Individual MI sample increments from stockpile DUs will be collected with a hand auger according to the SOP included in Appendix B. The hand auger will be advanced to a random depth listed in Table B1 (Appendix B) and individual increments (approximately 50 grams each) will be retrieved from the opening in the barrel and placed in a container. The random depths listed in Table C1 in Appendix C are based on the thickness of the stockpile (random depths have been calculated for stockpiles with thicknesses of 2 feet, 3 feet, 4 feet, and 5 feet, respectively). The increments from all the cells within a decision unit will collectively constitute a bulk sample that represents the stockpile. Note that for evaluating sample precision, one of the stockpile MI samples will be collected in triplicate. Triplicate sample increments will be collected from 1 foot east and 1 foot south, respectively, of the primary sample location within each cell.

2.2.4 MI Sample Processing

Upon collection, bulk soil samples will be shipped to the project laboratory in a gallon-size sealable bag for MI sample processing and analysis. Since white phosphorus will readily react with atmospheric oxygen and since the analysis will be performed at a different laboratory, a

separate bulk sample will be collected and shipped for this analysis. See Section 2.2.5 for special considerations for white phosphorus samples.

MI samples for other munitions constituent analyses (explosives, metals, and perchlorate) will be processed according to SOP included in Appendix B. The project laboratory will conduct sample processing which will include air drying, sieving with a 2 millimeter screen, the puck milling, and subsampling. The composited samples will be weighed (approximately 10, 30, 40, or 100 grams depending on the analytical method), and the mass will be documented for each analysis. The required sample mass and instructions that all explosives, metals, and perchlorate samples must be ground will be included in the laboratory's project profile and on the chain of custody form (as a reminder) as will the requirement for a description and photograph of the material that did not pass through the 2 millimeter screen.

2.2.5 Special MI Considerations for MI White Phosphorus Samples

Since white phosphorus is thermodynamically unstable and reacts with atmospheric oxygen, deionized water will be added, as needed, to the bulk MI samples to keep the soil pore space saturated. A separate bulk MI sample will be collected from each DU and submitted to the laboratory solely for the white phosphorus analysis. The bulk samples will be collected and submitted in 1-liter glass jar. Due to limited container volume, the 2 inch plugs will be cut in half lengthwise or a smaller diameter probe will be used to collect 10 to 15 gram soil increments. To minimize aeration, white phosphorus samples will not undergo MI sample particle size reduction (sieving, air drying, grinding, and etc.). Instead, the saturated white phosphorus bulk MI soil sample will be stirred and subsampled directly from the 1-liter jar, collecting approximately 30 to 40 increments from different areas within the jar. The subsampling will have to be completed within an hour so that the soil does not dry out. An instruction sheet will be included with the chain of custody form and these details will be included in the laboratory's project profile.

The project laboratory indicated it was their policy not to measure percent solids in white phosphorus samples. White phosphorus will be reported on a wet-weight basis.

2.2.6 MI Sample Analysis

The entire sample volume that is subsampled (10, 15, 30, 80, or 100 grams depending on the extraction or analytical method) will be used for each contaminant analysis. Additional sample containers will be prepared by the laboratory for percent solids determination and matrix spike/matrix spike duplicate (MS/MSD) analysis. Analytical sample requirements are shown in Table 2-3. The mass of each sample will be documented and sample results, except white phosphorus, will be corrected for moisture content and will be reported on a dry weight basis. Due to the flammability properties and safety concerns regarding white phosphorus, percent solids analysis will not be performed on white phosphorus samples, and results will be reported on a wet-weight basis.

Table 2-3 Multi-Incremental Soil Sample Requirements

Matrix	Analytical Group	Method	Sample Volume	Containers	Preservation Requirements	Maximum Holding Time
Soil	Munitions and Explosives	EPA 8330B	10 grams	The entire bulk sample will be supplied to the laboratory in a sealable plastic bag or sealed bucket for sample processing and subsampling.	4° C, dark	14 days
Soil	Metals (Total) ^a	EPA 6010C/6020A	10 grams		4° C	180 days
Soil	Mercury	EPA 7471	10 grams		4° C	28 days
Soil	Perchlorate	EPA 6850	10 grams		4° C	28 days
Soil	TCLP Nitrobenzene/ Dinitrotoluene	EPA 1311/ 8330B	100 grams		4° C	14 days for TCLP/ 7 days to extract/ 40 days to analyze
Soil	TCLP Metals ^b	EPA 1311/ 6020/7471			4° C	180 days
Soil	pH	SM9045D	10 grams		4° C	ASAP
Soil	Percent Solid	160.3 Mod	15 grams		4° C	14 days
Soil	White Phosphorus ^c	EPA 7580	100 grams	1-liter wide-mouth amber jar	4° C, pore space saturated with deionized water	30 days

^a – Metals analysis will include aluminum, antimony, arsenic, barium, bismuth, cadmium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, strontium, and zinc.

^b - TCLP metals will be analyzed for arsenic, barium, cadmium, chromium, lead, and mercury.

^c – Note that percent solid analysis will not be performed on white phosphorus samples due to the safety issues and that white phosphorus results will be reported on a wet weight basis.

TCLP – toxicity characteristic leaching procedure

2.3 Discrete Soil Sampling for Petroleum Constituents

Discrete samples will be analyzed for petroleum analyses. Petroleum may have been used to assist in the combustion of burnable debris at the OB/OD River Site. Discrete field screening samples will be collected and screened with a photoionization detector instrument (PID). Since the trenches and associated stockpile(s) have the greatest potential for petroleum contamination, field screening samples will be collected from all MI cells within the two trenches (DU-4 and DU-5) and associated stockpile(s). Five discrete soil samples will be submitted for laboratory analysis of the following petroleum analytes from the MI cells having the highest PID results within each trench and associated stockpile(s). Laboratory samples for petroleum will be analyzed by the following methods:

- Gasoline range organics (GRO by AK101)
- Diesel range organics (DRO by AK102)
- Volatile organic compounds (VOC by EPA Method 8260C-LL)
- Semivolatile organic compounds (SVOC by EPA Method 8270D-LL)

As there is potential for petroleum contamination outside of the trench areas, observations will be made for potential petroleum contamination while collecting MI samples. Field screening samples

will be collected from any MI sample cells having evidence of soil contamination. Up to 5 additional discrete soil samples will be submitted for laboratory analysis of petroleum contamination from locations (outside of trenches) having the highest PID results.

The screening samples will be placed in quart-size sealable plastic bags labeled with the DU and cell number, heated and mixed to enhance volatilization, and the headspace will be screened with a PID as described in the SOP included in Appendix B. The sample locations will be marked with a pin flag so they can be measured with a GPS.

Discrete soil samples will be collected from freshly exposed soil at a depth of roughly 6 to 12 inches below ground surface; a spade shovel will be used to open a hole and allow for sampling with core sampler and/or a stainless steel spoon. VOC and GRO will be collected first (using a Terra Core sampler) followed by semi-volatile analytes (using a new stainless steel spoon) according to the soil sampling SOP in Appendix B.

A field sketch will be prepared to show the approximate sample locations. The location of each discrete sample will also be measured with a GPS. Analytical sample requirements are shown in Table 2-4.

Table 2-4 Discrete Soil Sample Requirements

Matrix	Analytical Group	Method	Sample Volume	Containers^a	Preservation Requirements	Maximum Holding Time
Soil	GRO	AK101	50 grams	1 - 4 oz amber glass jar with teflon-lined lid ^a	4° C, methanol	28 days
Soil	VOC	EPA 8260C LL	5 grams	3 – 40 ml VOA vial with septa lid and stir bar ^a	4° C, 2 vials with 10 ml deionized water and 1 vial with 10 ml methanol ^b	14 days
Soil	DRO	AK102	30 grams	1 - 4 oz amber glass jar with teflon-lined lid ^c	4° C	14 days
Soil	SVOC	EPA 8270D LL	30 grams		4° C	14 days
Soil	Percent Solid	EPA 160.3	10 grams		4° C	14 days

^a – Sample containers for GRO and VOCs will be pre-weighed at the laboratory prior to shipment to field.

^b – The methanol preserved VOA vial is for mid-range analysis and may not be necessary; low level VOC analysis will be performed on the deionized water preserved sample containers.

^c - One 4-ounce jar filled with soil will be adequate to perform multiple methods, including percent solids analysis.

ml - milliliter

oz – ounce

VOA – volatile organic analysis

2.4 Collection of GPS Coordinates

Discrete sample locations for PID screening samples and laboratory samples will be marked with a pin flag labeled with the unique Location ID (LocID; see Section 3.4) and the locations will be measured with a sub-meter GPS so they can be included on report figures and relocated in the

future. In addition, the location of DU boundaries will also be collected with a GPS. The SOP for GPS data collection is included in Appendix B.

2.5 Equipment Decontamination

Non-disposable sampling equipment (e.g., driven probe) will be decontaminated between decision units to prevent cross-contamination. Disposable sampling equipment will be used for the collection of discrete samples, so decontamination is unnecessary. The equipment decontamination procedures are included in Work Plan of operable unit sites (FES, 2014). They include a non-ionic detergent wash and rinse with potable water.

2.6 Investigation Derived Waste Management

Investigation Derived Waste (IDW) will be managed as follows. Used wash water and unused soil (spent PID screening samples) will be discharged onto an existing soil stockpile. The location of discharge will be noted in field book. All disposable sampling equipment, miscellaneous debris, and gloves will be bagged and disposed of at the local Fairbanks solid waste facility.

3.0 QUALITY ASSURANCE/ QUALITY CONTROL

The information in this section supplements the Postwide Work Plan for sites on Fort Wainwright (FES, 2016).

3.1 Project Laboratories and Certification

The address and contact information for the project laboratories are listed below.

ALS Environmental (ALS) - Kelso, Washington
Attn: Kurt Clarkson (360-501-3356)
1317 S. 13th Ave.
Kelso, Washington 98626

ALS - Salt Lake City, Utah
960 W. LeVoy Drive
Salt Lake City, Utah 84123

ALS-Kelso will analyze the munitions/explosives, metals, perchlorate, and all petroleum samples. White phosphorus samples will be analyzed by the ALS laboratory located in Salt Lake City, Utah. ALS-Salt Lake is Environmental Laboratory Accreditation Program (ELAP) certified for white phosphorus method, and ALS-Kelso is ADEC certified for metals and petroleum analyses and is ELAP-certified for metals, petroleum, perchlorate, and explosives/munitions methods to be employed during this project. The ADEC Contaminated Sites program does not currently certify for explosives and munitions, perchlorate, or the white phosphorus methods. Laboratory certifications are included in Appendix D.

3.2 Data Quality Objectives

A summary of the analytical data quality objectives (DQOs) specific to the methods to be employed at the OB/OD River Site is included in Table E1 in Appendix E and is summarized below in Table 3-1. Reporting limits and soil cleanup levels are also included for comparison, and maximum toxicity characteristics concentrations are included for TCLP samples. All analyte-specific accuracies and precision requirements are consistent with requirements in the Quality System Manual for Environmental Laboratories (QSM) Version 5.0, as applicable.

Table 3-1 Data Quality Objectives for Soil Samples

Parameter	Method	LOD (mg/kg)	Cleanup Level (mg/kg)	Accuracy (%)	Precision (RPD, %)	Completeness (%)
Explosives and Munitions	8330B	0.008-0.08	Varies ^b	Varies ^c	20	90
Metals	6010C/6020A	0.02-10	Varies ^b	Varies ^c	20	90
Mercury	7471	0.005	1.4	80-125	20	90
Perchlorate	6850	0.005	0.067	84-121	15	90
White Phosphorus	7580	0.0005	0.036	70-141	20	90
GRO	AK101	2.5	300	60-120	20	90
VOC	8260C-LL	0.01-0.1	Varies ^b	Varies ^c	20	90
DRO	AK102	3.3	250	75-125	20	90
SVOC	8270	0.005-0.2	Varies ^b	Varies ^c	20	90
TCLP Nitrobenzene and 2,4-dinitrotoluene	1311/8330A	0.00002-0.00004 mg/L ^d	0.13-2 mg/L ^{d,e}	Varies ^c	30	90
TCLP Arsenic, Barium, Cadmium, Chromium, and Lead	1311/6010C	0.0025-1 mg/L ^d	5-100 mg/L ^{d,e}	80-120	20	90
TCLP Mercury	1311/7470	0.0002 mg/L ^d	0.2 mg/L ^{d,e}	80-120	20	90

^a Cleanup levels are the most stringent cleanup level from Tables B1 and B2 in 18 AAC 75.341 (ADEC, 2016a).

^b The analyte specific cleanup levels are presented in Appendix E.

^c The analyte specific accuracies presented in Appendix E are consistent with requirements in the QSM version 5.0, as applicable.

^d The units for TCLP extracts are in mg/L.

^e The cleanup level listed for TCLP samples are the maximum concentration for toxicity characteristic.

LOD – limit of detection

mg/kg – milligrams per kilogram

mg/L – milligrams per liter

QSM – Quality System Manual for Environmental Laboratories

RPD – relative percent difference

TCLP - toxicity characteristic leaching procedure

The limits of detection (LOD) for all analytes are reported with adequate sensitivity (less than the associated ADEC cleanup) except for two VOCs (1,2,3-trichloropropane and 1,2-dibromoethane) and three SVOCs [bis(2-chloroethyl)ether, n-nitrosodi-n-propylamine, and pentachlorophenol]. These reporting limits for these analytes are shown in gray highlight and red font in Table E1 of Appendix E to indicate this discrepancy. Since none of these five analytes are constituents associated with munitions, the impact to data is likely negligible.

3.3 Statistical Analysis of Multi-Incremental Samples

Additional statistical analysis will be performed on triplicate MI sample data to determine the usability of the data set and verify that it represents the decision unit. The equations in the 2012 Interstate Technology Regulatory Council guidance document (ITRC, 2012) will be used to determine fundamental error, relative standard deviation (RSD), and 95% upper confidence level (UCL) of the mean. The ITRC requirement for fundamental error (a function of grain size) and relative standard deviation of triplicate samples are summarized in Table 3-2.

Table 3-2 Additional Data Quality Objectives for MI Soil Samples

Analytical Group ^a	Method	Sample Volume	Fundamental Error ^a	Precision (RSD)
Munitions and Explosives	EPA 8330B	10 grams	≤15%	≤30%
Metals (Total)	EPA 6010C/6020A	10 grams	≤15%	≤30%
Mercury	EPA 7471	10 grams	≤15%	≤30%
Perchlorate	EPA 6850	10 grams	≤15%	≤30%
White Phosphorus	EPA 7580	100 grams	≤15%	≤30%
pH	SM9045D	10 grams	≤15%	≤30%
TCLP extract	EPA 1311	100 grams	≤15%	-
Percent Solid	EPA 160.3	15 grams	≤15%	≤30%

^a Fundamental error was calculated assuming a 100% solid matrix and a grain size of 2 millimeters. The maximum fundamental error recommended by ITRC is 15%.
RSD – relative standard deviation

The fundamental error calculated for 10 gram samples to be employed during this project, assuming 100% solid and a 2 millimeter particle size, is 13% and meets the requirement of less than or equal to 15%. The “Large Mass” sample sizes listed in Table 2 of the ALS SOP (Appendix B) will be used for all methods except for mercury by EPA Method 7471; the sample mass for mercury will be increased from 5 grams to 10 grams to meet the 15% fundamental error requirement. Error will be recalculated and included in the report after the actual percent solid is measured.

In addition, the 95% UCL will be calculated using the triplicate sample data. Note that for normal data distribution (RSD ≤30%) the UCL of the mean will be calculated based on the Student’s t distribution, and that for non-normal data distribution (RSD ≥ 30%), the UCL of the mean will be based on Chebyshev inequality equation.

The standard deviation, mean, RSD, and 95% UCL will be calculated for all decision units where triplicate MI data are available (including DU-4, DU-5, and one of the stockpiles) and submitted with the site characterization report. Sample results and 95% UCLs will be compared to the

ADEC cleanup levels and RSL (as per Table 2-1) to determine if the TCRA is complete. As noted in Table 2-1, EPA RSLs will be used for evaluating detected contaminants only if there is no ADEC cleanup level.

3.4 Field Quality Control Samples

Four types of QC samples will be used for the project: field replicates, trip blanks, equipment blanks, and matrix spike samples. A definition of each type of sample, and the situations in which they will be employed, are presented below.

3.4.1 Field Replicates

As described in Section 2.1.2, three of the nine MI samples will be collected in triplicate (from locations shown in the inset of Figure 5) and processed independently; this will allow for the statistical measure the precision of the sampling and analytical processes described in Section 3.3.

In addition, to allow for assessing sample precision, field duplicates will also be collected for discrete soil samples at a rate of 10 percent. Duplicate samples will be collected either simultaneously or sequentially from the same sampling location using identical methods.

Each replicate will be a blind sample, meaning it will be labeled with a sample number different from that of the sample being duplicated. Care must be taken in collecting replicates so that both samples represent the matrix being sampled, and the field team must record the sample number and site identification in the field logbook or on the sampling form.

3.4.2 Trip Blanks

Trip Blanks will accompany samples that include analyses for volatile compounds. They will be analyzed to evaluate potential cross-contamination during the sampling shipping and analysis process. Trip blanks are prepared using analyte-free media at the laboratory (deionized water for VOCs and methanol for GRO) and are shipped with the sample kit. One trip blank will be submitted per shipment of samples being analyzed for volatiles.

3.4.3 Equipment Blanks

Equipment blanks will be collected and analyzed to evaluate potential cross-contamination due to inadequate decontamination of sampling equipment. Equipment blanks will not be collected when disposable sampling equipment is used; therefore, they will only be used to evaluate MI sampling (since discrete samples will be collected using disposable equipment).

Equipment blanks are processed before collecting samples by rinsing decontaminated sampling equipment (i.e., driven MI soil sample probe) with distilled water. The rinse water is collected in sample bottles, and handled/analyzed in the same manner as the environmental samples. Equipment blanks will be collected at a frequency of one per the sampling event and analyzed for the same constituents as the project samples.

3.4.4 Matrix Spike Samples

MS/MSD samples will be used for evaluating potential matrix effects. They will be prepared for both MI and discrete soil samples. While there will be ample volume collected for MI samples during the MI process, additional sample volume will need to be collected for discrete MS/MSD samples.

Samples designated for MS and matrix spike duplicate (MSD) analysis will be indicated on the chain of custody form. Samples for MS/MSD analyses will be collected at a minimum rate of 5 percent. A minimum of one MS/MSD will be performed for each analysis per laboratory batch.

3.5 Sample Identification and Location Identification

For the purposes of sample tracking, each sample submitted to the analytical laboratory will be given a unique, alpha-numeric sample identification code corresponding to the sample numbering system described below. The sample identification codes indicate the year the sample was taken, the facility, the location of sample collection, the sequential sample number, and the matrix sampled. Each digit of the identification code is described below:

- Digits 1 and 2: Calendar year - the year code will be 16.
- Digits 3 and 4: Project ID. Digits 3 and 4 will be the facility code RS for River Site.
- Digit 5: D for Discrete or M for Multi-Incremental.
- Digits 6 and 7: Digits 6 and 7 will be a unique, sequential number, starting with "01."
- Digits 8 and 9: Two letters will designate the soil matrix (SO).

LocID will be used to identify where the sample was collected. Each digit of the LocID for MI samples is described below:

- Digit 1: M for Multi-Incremental.
- Digit 2: Digit 2 will indicate which DU (1 through 9) the sample was collected.
- Digits 3 and 4: Digits 3 and 4 will designate primary (PR) or one of the triplicates (TS or TW).

Each digit of the LocID for discrete samples is described below:

- Digit 1: D for Discrete.
- Digit 2: Digit 2 will indicate which DU (1 through 9) the sample was collected.
- Digits 3, 4, 5: Digits 3 through 5 will signify the unique MI cell number from which the sample was collected.

Discrete sample locations will be immediately marked with pin flags labeled with unique LocIDs so they can be measured with a GPS. In addition, approximate sample locations will be included on field book sketches. Figures showing MI cell numbers are included on compact disk (CD) in the Supplemental folder.

Records will be maintained in the sampler's logbook and/or tracking form as to each samples origin. The LocID will also be included on the related chain of custody form for use in the associated data deliverables.

4.0 RECORDS, REPORTING, AND MEETINGS

The following section identifies project documentation and describes the purpose of each activity. Documentation requirements are also discussed further in the QAPP.

4.1 Record Keeping

Field documentation is extremely important for recording field activities and field decisions. Field personnel will maintain documentation of both administrative and technical activities. The following types of documentation are required:

- Field logbook;
- Sample forms;
- Chain of custody forms; and
- Photographs.

A daily record will be kept of all field activities in a standard field logbook. The field logbook will contain information such as a record of sampling activities, weather and site conditions, on-site personnel, problems encountered in the field, and corrective actions. The field logbook will be maintained as part of the permanent record. Photographs will also document fieldwork.

4.2 Reporting Requirements

4.2.1 Reports

Investigation findings will be documented in draft and final reports. The report will be organized as follows:

- Introduction/Site Background Information
- Field Activities and Observations
- Results of Chemical Analyses (presented on tables and figures)
- Summary and Conclusion
- References
- Appendix A - Chemical Data Tables
- Appendix B – Chemical Data Quality Report (CDQR) and ADEC Laboratory Data Review Checklists
- Appendix C - Site Photographs
- Appendix D - Field Notes

The following procedures will be employed to ensure general reporting quality for interpretive reports:

- Technical peer review for technical accuracy, clarity, and organization;
- All calculations and measurements will be verified by the person who initially provided the data. The calculations and measurements will then be independently reviewed and verified by another individual. Any calculations and measurements that differ from the initial results are resolved by both individuals and documented; and
- Measurement data generated during an investigation will be reported in tabular form. Numerical values presented in reports and comparisons of numbers appearing in text, tables, and appendices will be addressed in the manner discussed above.

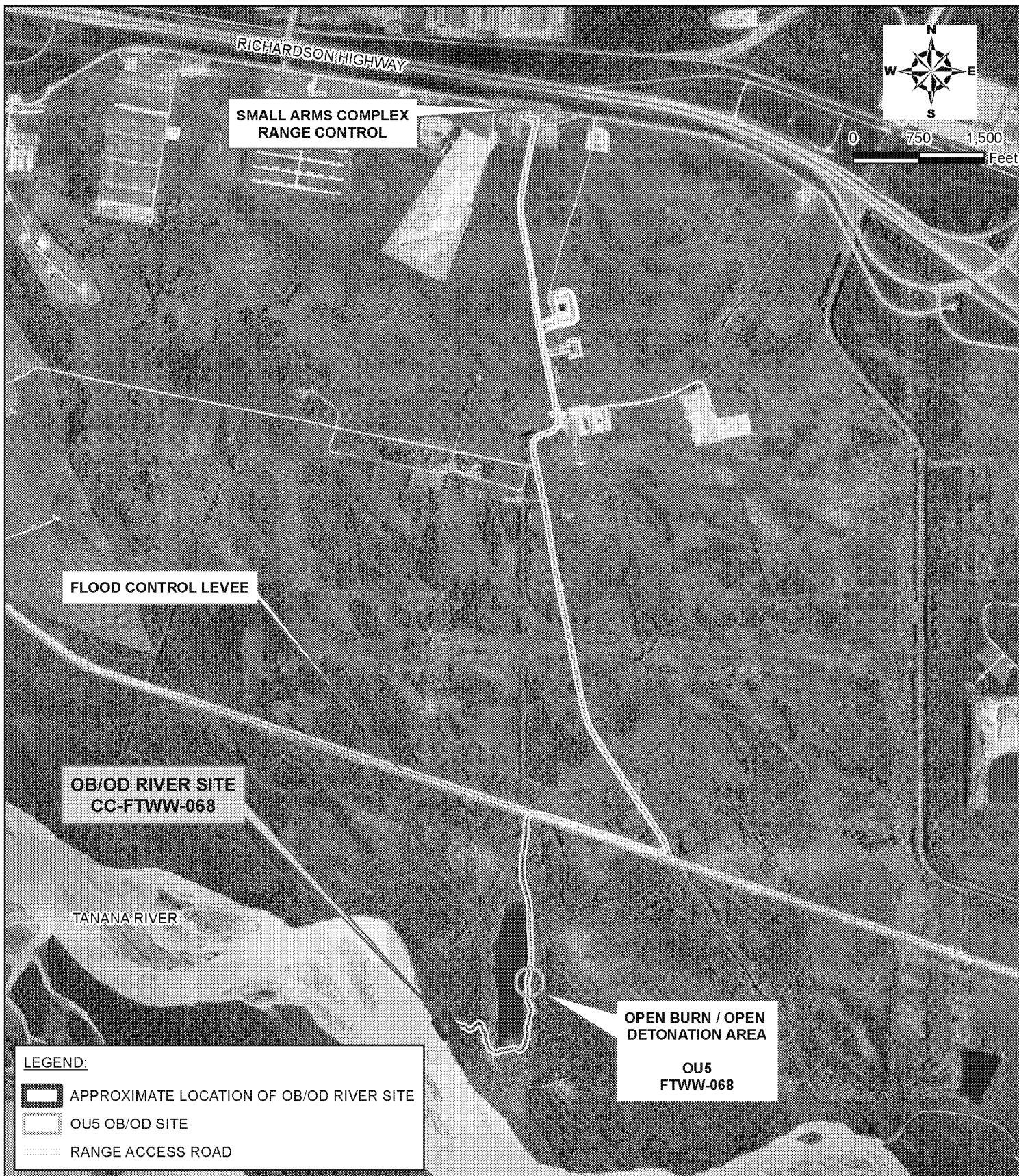
Reports will be checked for proper format, grammatical correctness, and correct references to figures, tables, sections, and appendices.

4.2.2 Analytical Data

Analytical data will be presented in concise summary tables and/or site drawings. ADEC laboratory data checklists and a chemical data quality report (CDQR) will be completed as described in the Postwide Work Plan (FES, 2016) and shall be included as an appendix. An Adobe Acrobat (pdf, electronic) copy of the laboratory data report and a Staged Electronic Data Deliverable (SEDD) Version 5.2 will be forwarded to the USACE Project Chemist with the draft report. A compact disk containing all laboratory data in PDF and SEDD format will be provided with the report.

5.0 REFERENCES

- ADEC, 2016a. *Oil and Other Hazardous Substances Pollution Control (18 AAC 75)*. Revised as of April 16.
- ADEC, 2016b. *Field Sampling Guidance*. March.
- CRREL, 2011. *Guidance for Soil Sampling of Energetics and Metals*. October.
- Department of Defense, 2013. *Quality Systems Manual for Environmental Laboratories, Version 5*. July.
- EPA, 2015. *Regional Screening Levels for Chemical Contaminants at Superfund Sites*. EPA Office of Superfund. November.
- FES, 2016. *Preliminary Draft 2016 Postwide Work Plan, Fort Wainwright, Alaska*. April.
- Interstate Technology Regulatory Council, 2012. *Technical and Regulatory Guidance, Incremental Sampling Methodology*. February.
- Jacobs, 2014. *Technical Memorandum, Site Visit Small Arms Complex, Fort Wainwright, Alaska (Draft)*. October.
- Military Munitions Center of Expertise, 2005. *Technical Update, Munitions Constituent (MC) Sampling*. March.
- USACE, 2015. *Statement of Work, Modification 003002, Confirmation Sampling at OB/OD River Site, Fort Wainwright, Alaska*. 18 August.
- USAGAK, 2015a. *Progress Report Update, Time Critical Removal Action for OB/OD River Site, CC-FTWW-068, Fort Wainwright, Alaska*. October 2.
- USAGAK, 2015b. *Solid Waste Management Unit Assessment Report, Small Arms Complex, OB/OD Detonation River Site, Fort Wainwright, Alaska*. December.
- USARAK, 1994. *Background Data Analysis for ARSENIC, BARIUM, CADMIUM, CHROMIUM, & LEAD on Fort Wainwright, Alaska*. March.



NOTE:

1. Coordinate System - Projection: World Geodetic System 1984 (WGS84) Universal Transverse Mercator (UTM), Zone 6N

SOURCES:

1. Aerial imagery obtained from Department of Public Works (DPW) Environmental, 2012



USAGAK
Ft. Wainwright, AK

Site Location and Vicinity Map
Soil Sampling Work Plan
OB/OD River Site
Fort Wainwright, Alaska

Contract: W911KB-12-D-0001

Figure: 1

Date: 6/16



NOTE:

1. Coordinate System - Projection: World Geodetic System 1984 (WGS84) Universal Transverse Mercator (UTM), Zone 6N

SOURCES:

1. Metal Debris Mapping at the Tanana River Military Munitions Waste Site using Geophysical Measurements, Technical Report - March 2015, CRREL

2. Aerial imagery obtained from Department of Public Works (DPW) Environmental, 2012



USAGAK
Ft. Wainwright, AK

Pre-TCRA Electromagnetic Responses
Soil Sampling Work Plan
OB/OD River Site
Fort Wainwright Alaska

Contract: W911KB-12-D-0001

Figure: 2

Date: 6/16



NOTE:

1. Coordinate System - Projection: World Geodetic System 1984 (WGS84) Universal Transverse Mercator (UTM), Zone 6N

SOURCES:

1. Satellite imagery is a World View 3 image from DigitalGlobe Inc., September 7, 2015. Resolution: 0.31 Meters.



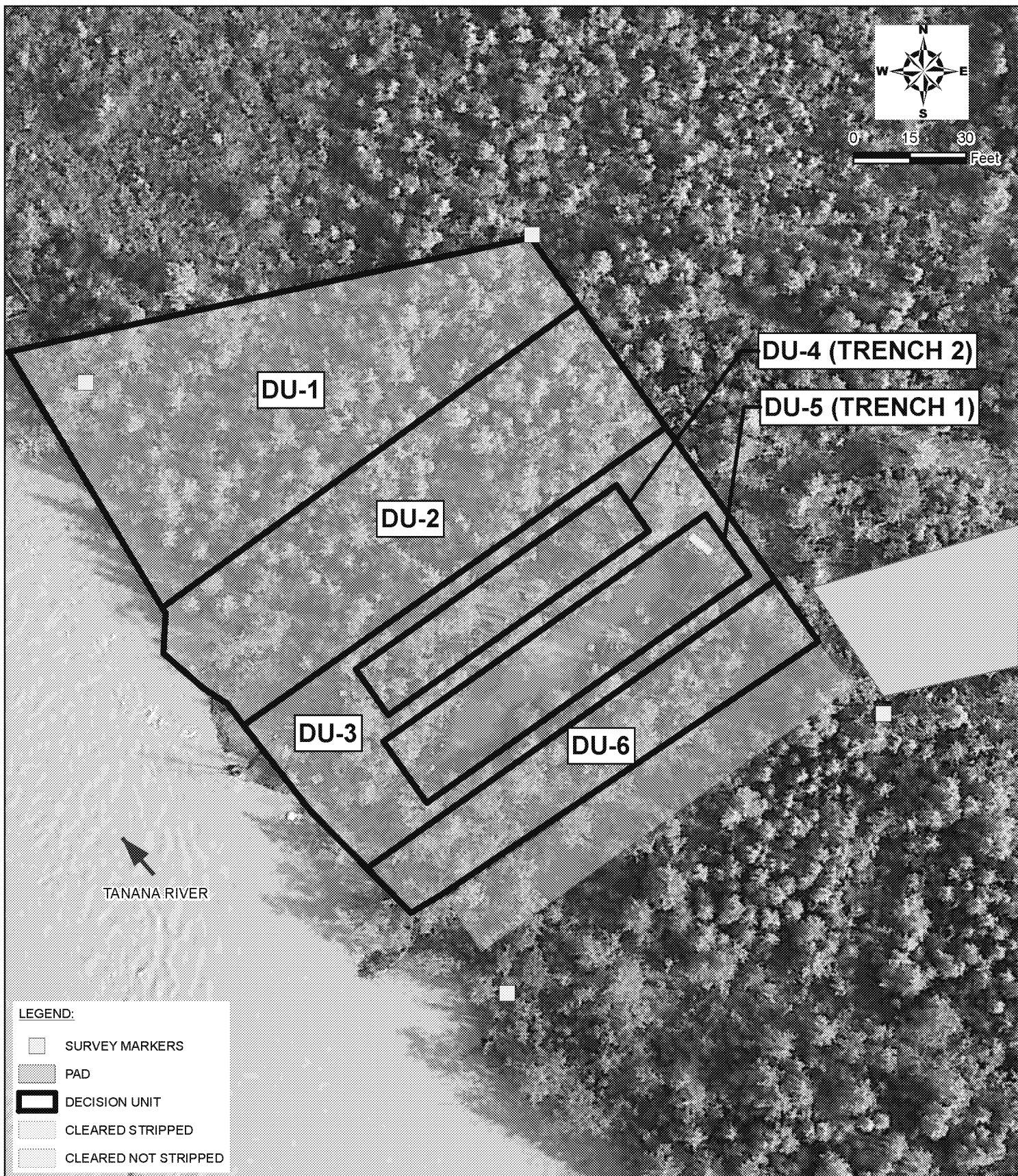
USAGAK
Ft. Wainwright, AK

Aerial View of Site During TCRA
Soil Sampling Work Plan
OB/OD River Site
Fort Wainwright Alaska






Contract: W911KB-12-D-0001

Figure: 3

Date: 6/16



LEGEND:

-  SURVEY MARKERS
-  PAD
-  DECISION UNIT
-  CLEARED STRIPPED
-  CLEARED NOT STRIPPED

NOTE:

1. Coordinate System - Projection: World Geodetic System 1984 (WGS84) Universal Transverse Mercator (UTM), Zone 6N

SOURCES:

1. Aerial imagery obtained from Department of Public Works (DPW) Environmental, 2012



USAGAK
Ft. Wainwright, AK

Proposed Decision Units for Multi-Incremental Sampling
Soil Sampling Work Plan
OB/OD River Site
Fort Wainwright Alaska

Contract: W911KB-12-D-0001

Figure: 4

Date: 6/16

SAMPLE LOCATIONS WITHIN CELL

PRIMARY SAMPLE
(0.5X, 0.8Y)

TRIPLICATE #2
(1FT EAST OF
PRIMARY)

INDIVIDUAL CELL

TRIPLICATE #3
(1FT SOUTH OF
PRIMARY)



0 15 30
Feet

TANANA RIVER

LEGEND:

- PRIMARY SOIL SAMPLE LOCATION
- GRID
- SURVEY MARKERS
- CLEARED STRIPPED
- CLEARED NOT STRIPPED
- DU-1
- DU-2
- DU-3
- DU-4 (TRENCH)
- DU-5 (TRENCH)
- DU-6

NOTE:

1. Triplicate MI samples will be collected from DU-4 and DU-5.
2. Cell dimensions for DU-1 and DU-2 are 10' X 10', DU-3 through DU-6 cell dimensions are 5' X 5'.
3. Coordinate System - Projection: World Geodetic System 1984 (WGS84) Universal Transverse Mercator (UTM), Zone 6N

SOURCES:

1. Aerial imagery obtained from Department of Public Works (DPW) Environmental, 2012



USAGAK
Ft. Wainwright, AK

Decision Unit Details
Soil Sampling Work Plan
OB/OD River Site
Fort Wainwright Alaska

Contract: W911KB-12-D-0001

Figure: 5

Date: 6/16

APPENDIX A
MEC Identified and Associated Constituents

Table A1 - Munitions Constituents Associated with Items Identified
Tanana River OB/OD Site (CC-FTWW-068)

Item Identified ¹	Quantity	Possible Component	Reference	Analytical Methods to Run
M48 series Point Detonating (PD) fuzes	5	primer black powder delay charge; relay M7, detonator M24	www.everyspec.com TM-43-0001-26	6020 (Pb, Sb)
		black powder (sulfur, potassium nitrate)	http://www.compoundchem.com/2014/07/02/the-chemistry-of-gunpowder/	None ²
		M24 (lead azide, antimony sulfide)	http://mil-spec.fpub.com/MIL-D/MIL-D-46256B/index.htm	6020 (Pb, Sb)
M108 100 pound series bomb fuzes	16	used with M4 burster with tetryl	M47 100# series; M108 bomb fuze.pdf	8330B (Tetryl)
		tetryl (2,4,6-trinitrophenylmethylnitramine)	http://www.atsdr.cdc.gov/toxfags/tfacts30.pdf	8330B (Tetryl)
Rifle grenade star clusters	9	M15 & M19 had white phosphorus filler	M17A1 ground signal (rifle grenade).pdf	7580 (White Phosphorus)
M728 Variable Time (VT) fuzes	13	M55 stab detonator; booster standard composition A5, lead	www.everyspec.com TM-43-0001-28, p 7-126 for M732 VT fuze	8330B (RDX), 6020 (Sb, Ba, Pb)
		M55 stab detonator (barium nitrate, lead styphnate, antimony sulfide, lead azide, tetracene)	http://mil-spec.fpub.com/MIL-D/MIL-D-46256A/	6020 (Sb, Ba, Pb)
		A5 (98.5% RDX, 1.5% stearic acid)	http://www.fpub.com/gunners/3.htm	8330B (RDX)
2 pound incendiary bombs	20	magnesium alloy casing, 1.8 # thermate, same components as AN-M50A1	AN-M52 2lb incendiary.pdf, http://pwencycl.kgbudge.com/B/o/Bombs.htm	6020 (Al, Ba, Fe)
		thermate (thermite, barium nitrate, sulfur in oil binder)	http://mil-spec.fpub.com/MIL-D/MIL-D-46256B/index.htm	6020 (Al, Ba, Fe)
		thermite (powdered aluminum and iron oxide)	http://www.taipo.it/files/tm-9-1325-200-bombs-and-bomb-components-usa-1966-329-pag.pdf	6020 (Al, Fe)
M103 bomb tail fuze	1	booster charge tetryl	AN-M103A1 bomb fuze.pdf	8330B (Tetryl)
105 mm HE (2 partials and 2 complete but unfuzed)	4	high explosive may be cast TNT or composition B	M1 105mmHE www.everyspec.com	8330B (TNT)
		composition B (TNT, RDX, HMX)	TM 9-1300-214	8330B (TNT, RDX, HMX)
10 pound incendiary bombs with fuze domes	13	6 oz white phosphorus igniting charge, dome has 2 bags Mg-black powder, filling is 2.75# PT1	M74 10# incendiary	7580 (White Phosphorus), 6020 (Mg)
		PT1 (gasoline, magnesium, isobutyl methacrylate ³)	TM 9-1325-200	AK101 (gasoline range organics) ⁴
100 pound incendiary bombs	Unknown	M4 burster (RDX) or 1 pound black powder Burster M7	http://www.swf.usace.army.mil/portals/47/docs/enviro-nmental/fuds/Spoints/specs/100chemical.PDF	8330B (RDX)
		filler: gasoline and rubber (LA-60, CR, LA-100, or SR)		AK101 (gasoline range organics) ⁴
M101A1 tail fuzes	63	primer detonator M14, tetryl, dimethylaniline, nitric acid, sulfuric acid	AN-M101A1-A2 bomb fuze.pdf	8330B (Tetryl), SM9045 (pH), 8270D (dimethylaniline)
		M14 (black powder)	MIL-P-20365A	None ²
M151 tail fuzes	8	tetryl, dimethylaniline, nitric acid, sulfuric acid	MIL-HDBK-137- Volume 2	8330B (Tetryl), SM9045 (pH), 8270D (dimethylaniline)
M1 50 cal tracer	Numerous	propellant IMR 5010, tracer R256	TM 43-0001-27JMC	8330B (DNT)
		tracer 256 (8.3% calcium resinate, 26.7% strontium peroxide, 26.7% magnesium powder, 33.3% strontium nitrate)	http://wetlands.simplyaquatics.com/d/19613-1/tip-color.pdf	Ca, Mg, Sr (6020)
M2 50 cal ball, M33 50 cal, M2 50 cal armor piercing		propellant WC860 (90% NC, 10% NG)	TM 43-0001-27JMC, ERDC/CRREL TR-12-9	8330B (NG)
M23 50 cal incendiary		propellant IMR4831 (NC, DNT - typically about 90% NC, 10% DNT)	TM 43-0001-27JMC, http://www.imrpowder.com/msds/index.php	8330B (DNT)
	IM28 (10% potassium perchlorate, 40% barium nitrate, 50% magnesium aluminum alloy)	TM 43-0001-27JMC, http://wetlands.simplyaquatics.com/d/19613-1/tip-color.pdf	6020 (Al, Ba), 6850 (Perchlorate)	

¹ The items in this table were listed in the final TCRA removal action summary report dated 10/06/2015. All MEC items were transferred to EOD and destroyed.

² No analyses are recommended because associated compounds are either ubiquitous in the environment (black powder constituents and magnesium) or unstable (isobutyl methacrylate³).

³ Isobutyl methacrylate is unstable, subject to polymerization and combustion under typical analytical conditions.

⁴ Gasoline range organics will be analyzed on discrete samples only. Discrete sampling will focus on petroleum constituents.

CR - crepe rubber
DNT - dinitrotoluene
EOD - Explosive Ordnance Disposal
HE - high explosive
HMX - octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine

LA - crude latex
MT - mechanical time fuze
MTSQ - mechanical time and superquick fuze
NC - nitrocellulose; basically, a wood filler, not hazardous
NG - nitroglycerin

PD - point detonating
RDX - research department explosive
SR - smoked rubber sheets
TNT - trinitrotoluene
VT - variable time

APPENDIX B
Standard Operating Procedures

FIELD DOCUMENTATION

(FIELDDOC-1, Revision 1, 2/24/2015)

Field procedures for the following activities are described in this SOP:

- Field Forms
- Logbooks
- Photographs and Videos

FES personnel will keep accurate written records of field activities. The information will either be documented on a field form or in a log book. Field forms will be used for documenting common field activities including groundwater and soil sampling. Other field activities will be documented in field logbooks.

All entries will be legible, written in waterproof ink, and contain accurate and inclusive documentation of the field activities. Errors or changes will be noted using a single line to cross out the entry and will be dated and initialed. The field forms and logbooks will be maintained as part of the permanent record for the site. Field forms and logbooks will be available for review during systems audits or at any other time for quality control (QC) checks. Daily field forms for decommissioning activities will be used on a project basis.

Field Forms

A number of field forms have been developed to document field activities. The field forms may be used in combination with a field book to document project details. Examples of field forms that may be used are listed below.

- Soil boring log
- Well completion log
- Well development log
- Monitoring well decommissioning form
- Groundwater sampling form
- Surface water sampling form
- Multi-incremental (MI) sampling form
- Chain-of-custody
- Air monitoring form
- PID screening log
- XRF tracking form

- GPS survey log
- Daily project log
- Photographic log
- Site visitor log

Logbooks

For field activities that are not covered on field forms, logbooks will be used for documentation. This documentation will generally contain the following information:

- Name of author, and date and time of entry
- Sequential logbook page numbers
- Location of activity and site conditions
- Names and affiliations of personnel onsite
- Field observations and comments
- Weather conditions
- Rationale for sampling locations and for any changes to sampling protocol
- Site sketches
- Health and safety comments
- Conversations with the USACE and DPW representative
- Field instrument calibration documentation

Photographs and Videos

Photographs or videos will be taken for visual documentation of a site or procedure. If possible, a reference point (building, sign, etc.) will be included to assist in verifying the location of the photograph and provide an approximate scale. The name of the photographer, date, time, site location, site description, and the direction in which the photograph is taken (if applicable) will be entered sequentially in the logbook as photos are taken.

SOIL SAMPLING

(SOIL SAMP-1, Revision 3, 4/22/2016)

The following topics related to soil sampling are covered in this SOP:

- General soil sampling procedures
- Subsurface soil sampling, including the following boring methods
 - Hand Auger/Post Hole Digger
 - Soil Probe
 - Direct Push Macro-Core MC5
 - Direct Push Dual Tube
 - Split Spoon and Solid Barrel Sampler
- Surface Soil Sampling

Many different types of sampling devices can be used to collect soil/sediment samples. Typically direct-push soil sampling systems will be used where subsurface sampling is required and contamination is confined to a discrete depth range, or at sites where the available sampling area is limited. Sampling devices are available in a variety of diameters and lengths, allowing for the collection of varying sample volumes. Soil sampling procedures and sampling handling requirements are discussed in the sections below. The soil sampling procedures described in this section are in accordance with the Alaska Department of Environmental Conservation (ADEC) *Field Sampling Guidance* (ADEC, 2016).

General Sampling Procedures and Sample Handling Requirements

Petroleum-based lubricants will not be used on equipment that is in direct contact with the soils to be sampled. Observations including presence of odor or staining, presence of water or ice, soil type, soil color, and field-screening results will be recorded in a field book or field boring log. Efforts will be made to employ new, disposable sampling equipment whenever possible. Disposable sampling equipment may include polyvinylchloride (PVC) boring liners, stainless steel spoons, and nitrile gloves. If non-disposable equipment is used (e.g., shovel, auger, etc.), equipment will be decontaminated between each sample collected, and an equipment blank sample will be collected to evaluate the potential of cross-contamination per approved Work Plan.

The following general procedures will be adhered to during soil sampling:

- Discard all material greater than ¼-inch in diameter, when possible.
- Collect volatile samples first, followed by non-volatile sample collection.
- Soil sampling for volatiles (e.g., volatile organic compounds [VOC], gasoline range organics [GRO]) requires special procedures to minimize the loss of volatile

compounds during transit from the field to the laboratory. Volatile soil sampling procedures, including low level VOCs, are further discussed in the section below.

- Non-volatile samples will be packed inside the sample jar such that headspace is minimized.

Field duplicate samples will be collected in the same manner as primary samples, except that effort will be made to collect a homogenous duplicate sample pair. Non-volatile samples will initially be transferred from the auger, shovel, or boring liner to a zip-closure bag or stainless steel bowl and mixed prior to containerization. Alternatively, volatile sample field duplicates will be collected by alternating scoops of soil into each methanol-preserved sample jar (this will require using two field scales).

Sample labels will include sample number, sample date and time, sampler's initials, analytical method, and location ID. Soil samples will be immediately placed in a sample cooler after containerizing. Sample coolers will contain ice or gel ice to maintain proper temperature preservation.

Volatile Soil Sampling Procedures

Soil samples for analysis of volatile compounds (e.g., mid-level VOC, GRO) should be collected in a manner that minimizes volatilization. Sampling methods that utilize mixing or unnecessary soil disturbance should not be used. The sampling method used should be based on the soil type, and may include a coring device (preferred) or spoon/scoop sampler. Certain soil types and/or site conditions are not amenable to core type devices. In such cases, a stainless steel spoon or scoop sampler will be used to transfer the soil into the jar utilizing field techniques that minimize volatilization.

The following procedures should be followed for volatile analysis sampling:

- Collect a minimum of 25 grams of soil (50 grams is preferred) with minimal disturbance directly into a tared 4-oz or larger jar with a Teflon-lined septum. Do not collect volatile samples from an interim container.
- Efforts should be made to collect the sample as soon as possible after the soil is exposed to the air. ADEC recommends collection of the sample within 2 minutes.
- Immediately after collection, add 25 mL methanol and ensure the sample is completely submerged. If an extended period of time elapses between sample collection and preservation, this should be documented on the field form and in the field notes, and discussed in the final report.
- Do not place tape or another label on the sample container directly as the jar has been pre-weighed by the laboratory.

- Immediately store the sample in a cooler at $4^{\circ}\text{C} \pm 2^{\circ}\text{C}$
- Collect a sample of the same material from the same location in an unpreserved jar for percent moisture determination.

The volatile soil sampling procedures listed above should be followed for low level volatile analysis sampling with the following revisions:

- Collect 5 grams of soil using a coring device and transfer it into a pre-weighed 40-ml vial with 10 mls of deionized water, and immediately seal the vial.
- In addition to the water-preserved sample, a methanol preserved sample can be collected using same techniques for mid-level VOC analysis (for samples with elevated concentrations of analytes).
- Additional ice will be necessary to keep samples frozen during shipment.

Subsurface Soil Sampling

Subsurface soil samples may be collected using various sampling equipment depending on the specifics of the project site. Descriptions of common sampling devices are presented below.

Field procedures for the following activities are described in this section:

- Hand Auger/Post Hole Digger
- Soil Probe
- Direct Push Macro-Core MC5
- Direct Push Dual Tube
- Split Spoon and Solid Barrel Sampler

Hand Auger/Post Hole Digger

A hand auger equipped with extensions and a "T" handle, or post hole digger, are used to obtain samples from a depth of up to 6 feet. The auger or posthole digger is used for soil boring at an angle of 45 to 90 degrees from horizontal. When the entire blade has penetrated soil (or to the extent possible), the auger or post hole digger is removed from the soil by lifting straight up without turning it, if possible. If the desired sampling depth has not been reached, the soil should be removed from the blade and deposited onto plastic sheeting. This procedure is repeated until the desired depth is reached and the soil sample is obtained. The auger or post hole digger is then removed from the boring, and the soil sample is collected directly from the blade into an appropriate sample container. Soil will be removed from the boring device and placed into sample jars by hand using a

new nitrile glove and disposable stainless steel spoon. Effort will be made to containerize soil that has not come in direct contact with the auger or posthole digger.

Soil Probe

A variety of manual soil probe devices may be used to obtain samples from a depth of up to 3 feet. Soil probes are typically stainless steel and advanced using a “T” handle or slide hammer. Soil probes provide a quick soil profile or description. Probes cut a core sample slightly smaller than the inner diameter of the probe body to allow for easy removal of the core from the cylinder. Some probe models also have a sample liner to aid in sample removal and decrease the potential for cross-contamination. The probe will be advanced to the desired depth and then carefully backed out as to not lose the sample.

Direct Push Macro-Core MC5

Soil samples may be collected from soil borings employing the Geoprobe® Macro-Core MC5 sampling system. A continuous soil core will be retrieved in four or five foot intervals encased in disposable PVC liners. The top and bottom of each liner will be marked to avoid confusion regarding the depth intervals. Soil will be removed from the liner using new nitrile gloves and disposable stainless steel spoons.

Direct Push Dual Tube

Dual tube sampling uses two sets of direct push probe rods to collect continuous soil cores. One set of rods is driven into the ground as an outer casing, and a second set of rods is placed inside the first set to collect a sample. The outer casing includes an expandable cutting shoe that guides the soil core into the inner sampling rods. The smaller sampling rods utilize a disposable PVC liner which can be retracted to retrieve each soil interval. The liners will be marked immediately after retrieval (to identify the depth interval of each end of the liner), and samples will be collected from the liners using new nitrile gloves and disposable stainless steel spoons.

Split Spoon and Solid Barrel Sampler

A 2.5-inch inside diameter (ID) split or solid barrel sampler can be attached to the direct-push drill rig and can be used with the hollow-stem auger method of drilling. Split spoons are tubes constructed of high-strength alloy steel with a tongue-and-groove arrangement running the length of the tube, allowing it to be split in half. The two halves are held together by a threaded drive-head assembly at the top and a hardened shoe at the bottom, with a beveled cutting tip. The sampler is hammer-driven with a variety of hammer configurations. When the split spoon is brought to the surface, it is disassembled and the core is removed.

Barrel samplers are similar to split spoons except they cannot be taken apart; a core extruder might be required to remove the core from the barrel. Split spoons provide

samples from cohesive soils. Solid barrels are more appropriate in sand, silts, and clays. A series of consecutive cores may be extracted with a split-spoon sampler to give a complete soil column profile, or an auger may be used to drill down to the desired depth for sampling. The split spoon is then driven to its sampling depth through the bottom of the augured hole, and the core is extracted. The following procedure for split-spoon sampling describes the collection and extraction of undisturbed soil cores:

- Place a core catcher inside the drive shoe and assemble the sampler by aligning both sides of the barrel and then screwing the drive shoe on the bottom and the head piece on top.
- Using a well ring, drive the tube. Do not drive past the bottom of the head piece, or compression of the sample will result.
- Record on the soil boring log or in the field logbook the length of the tube used to penetrate the material being sampled, and the number of blows required to obtain this depth.
- Withdraw the sampler and open by unscrewing the bit and head and splitting the barrel. The amount of recovery and soil type should be recorded on the boring log. If a split sample is desired, a cleaned, stainless steel knife should be used to divide the tube contents in half, lengthwise.

A small portion at the top of the sampler (slough) will be discarded. Soil will be immediately removed from the split-spoon and placed into sample jars using new nitrile gloves and disposable stainless steel spoons. Effort will be made to containerize soil that has not come in direct contact with the split spoon.

Surface Soil Sampling

Surface soil samples are defined as soil that extends up to two feet below ground surface (bgs; ADEC, 2012). Samples may be collected using a shovel, manual soil probe, and/or stainless steel utensils such as spoons, trowels, and scoops. The shovel, probe, or utensil will be advanced to the desired depth and used to extract a sample. If a shovel is used, the soil will be removed from the shovel or the base of the excavation and placed into sample jars using new nitrile gloves and disposable stainless steel spoons. Effort will be made to containerize soil that has not been in direct contact with the shovel.

SOIL SAMPLING WITH SOIL PROBE

(PROBE-1, Revision 1, 8/3/2010)

Field procedures for the following activities are described in this section:

- Soil Probe Overview
- Soil Sample Collection
- Soil storage
- Documentation

Soil Probe Overview

Soil probes are light-weight, inexpensive equipment that can easily be carried to field sites. However, soil probes will only work on certain soil types (ie. soils with limited cobbles) and are only practical for obtaining surface soil samples. Soil probes are especially useful for obtaining Multi-Incremental (MI) samples because they are fast and can obtain consistent soil volumes at reproducible soil depth intervals.

A soil probe has a cutting edge which advances the device through the subsurface by force. The force can be from direct downward force from the sampler on a “T” handle or it can be from a weighted slide hammer attached to the top of the probe barrel. As the barrel moves down into the soil column, soil will be forced into the barrel of the probe. The soil can be collected for sampling purposes from a window in the side of the barrel.

The soil probe will be decontaminated between each discrete sample location, or between decision units in the case of Multi-Incremental sampling.

Collecting Soil Samples

Drive the probe to the desired depth (typically no more than 1 foot below ground surface). Remove the barrel from the ground (the slide hammer may be used to help extract the barrel from the ground). Using a new pair of nitrile sampling gloves and a stainless steel sampling spoon or spatula, remove the soil sample from the barrel and place it into appropriately labeled sample jars or container. Generally material greater than ¼-inch in diameter can be discarded. Volatiles should be collected first, and non-volatiles should be collected afterwards. The mass of volatiles samples can be measured using a field scale to determine adequacy. Otherwise, soil samples are packed inside the sample jar such that headspace is eliminated. Lastly, remaining soil will be placed into a sealable plastic bag for field screening, if desired. Labels will include sample number, sample date and time, sampler's initials, analytical method, and a location ID.

If samples are to be collected for MI purposes, collect the individual soil increment by removing the soil plug from the desired depth interval using a spatula and a gloved hand and place it into the “bulk” container (typically a bucket or large sealable bag). Multiple plugs at different depth intervals can be removed, if desired, to represent different strata. Move to the next MI cell location and collect another increment in the same fashion.



Field replicate samples will be collected in the same way as primary samples, except the soil may initially be transferred from the probe to a stainless steel bowl and mixed prior to input into the sample jars. Note that this technique can only be used for non-volatile analyses such as metals or DRO. Alternatively, field replicate samples can be collected by placing alternating scoops into the sample jar sets. MI duplicates/triplicates are collected from separate systematic sample locations.

Sample Storage

Soil samples collected from soil borings will be immediately placed in a sample cooler. Sample coolers will contain ice or gel ice to maintain proper temperature preservation.

Documentation

Observations including sample collection location (GPS coordinates), presence of odor or staining, presence of water or ice, and soil types will be recorded in a field book.

FIELD SCREENING WITH A PID (PID-1, Revision 4, 2/24/2015)

Field procedures for the following activities are described in this SOP:

- Instrument Calibration
- Field Screening Procedure

Soil samples may be monitored for organic vapors using a calibrated photoionization detector instrument (PID). Soil samples will be field screened by measuring headspace concentrations in a clean, sealed plastic bag. All field screening results will be documented on a boring log or in a field log book.

Calibration - Photoionization Detector (MiniRAE Lite PGM 7300 or equivalent)

The instrument will be calibrated prior to use on a daily basis. Calibration will be done following the manufacturer's procedures using a 100 ppm isobutylene calibration gas. The instrument calibration will be checked daily using the standard gas, with an accuracy acceptance range of $\pm 5\%$ of the standard value. If the acceptance range is exceeded, the instrument will be rezeroed and recalibrated. If the acceptance range is still exceeded, the instrument will be sent back to the manufacturer to be serviced.

Field Screening Procedure

- Partially fill (one-third to one-half) a clean jar or clean zip-closure bag with the sample to be analyzed. Total capacity of the jar or bag may not be less than eight ounces (approximately 250 milliliters [mL]), but the container should not be so large as to allow vapor diffusion and stratification effects to significantly affect the sample.
- Headspace vapors must be allowed to develop in the container for at least 10 minutes but no longer than one hour. Containers must be shaken or agitated for 15 seconds at the beginning and end of the headspace development period to assist volatilization. Samples should be warmed to at least 40 degrees Fahrenheit ($^{\circ}\text{F}$) (approximately 5 degrees Celsius [$^{\circ}\text{C}$]). Instruments must be calibrated for the appropriate temperature.
- After headspace development, the instrument sampling probe must be inserted to a point about one-half the headspace depth. The container opening must be minimized and care must be taken to avoid uptake of water droplets and soil particulates.
- After probe insertion, the highest meter reading must be taken and recorded, which normally will occur between two and five seconds after probe insertion. If erratic meter response occurs at high organic vapor concentrations or conditions of elevated headspace moisture, a note to that effect must accompany headspace data.

Trimble GeoXH GPS Operation

(GPS-1, Revision 5, 1/15/2015)

Field procedures for the following activities are described in this SOP:

- Global Positioning System (GPS) Planning
- GPS and ArcPad Settings
- Feature Logging
- Site Layout Settings
- Quality Control Feature Logging

GPS Planning

Trimble Planning Tool

FES personnel will utilize the Trimble Planning software to determine the optimal time for conducting the GPS survey at the site. The planning tool provides the number of available satellites and potential dilution of precision (PDOP) values over the course of the day, and is accessed through the GPS Correct "Plan" menu. Every effort will be made to collect data during the optimal times, and this will be recorded in the field book and on the GPS log.

Georeferencing

The imagery that will be used for project drawings should be evaluated prior to the GPS survey. If the imagery to be used is not orthorectified, site features should be identified for georeferencing. These features may include buildings, roads, or other prominent site features. GPS data should be collected for these features and used for georeferencing the image.

Potential imagery sources include Google Earth Pro, Alaska Mapped (<http://www.alaskamapped.org/>), or Aerometric.

GPS and ArcPad Settings

The GPS will be charged overnight prior to use to ensure full battery life. If using the GeoXH 6000, the battery should be removed if the unit is left unplugged overnight. The battery is prone to discharge if left in the unit.

The GPS does not require calibration prior to taking it into the field, however it does need several minutes to achieve a satellite lock and may require up to five minutes in forested areas. Before the GPS is taken into the field, personnel will ensure that a current almanac has been acquired (within the last 10 days), and that the correct project files, including any appropriate imagery and geodatabases, have been loaded.

- To download a current almanac: In ArcPad, with GPS active, go to the GPS Correct menu "Setup", sub-menu "Options" and select "Reset GPS Receiver". This should force the GPS to download a current almanac, but a new almanac should download automatically within 10-15 minutes of activating the GPS.



Either a Trimble GeoXH 2005, Trimble GeoXH 2008, or Trimble GeoXH 6000 mobile mapping GPS will be used.

Table 1 – ArcPad GPS Preferences Menu

Field	Default or Trimble Recommended	FES Standard
GPS		
Protocol	Blank	Trimble GPS Correct
Port		COM3:TSIP Serial Port
Baud		9600
Capture		
Enable Averaging	Cleared	Checked
Number of Positions to Average	10 points; 10 verticies	30 points; 10 vertices (assuming carrier lock is maintained between points)
Streaming	Position Interval: 1 second Distance Interval: 2 m	Position Interval: 1 second Distance Interval: 5 ft
Quality		
Warnings	No Warnings	<u>Compulsory Warnings:</u> Maximum PDOP: 6 Minimum HDOP: 4 *Settings dependent on multipath conditions
DGPS Only (WAAS)	Unchecked	Pin Flags: Checked Collection: Unchecked (may leave checked if more constraints are applied) *Settings dependent on multipath conditions
3D Mode Only	Unchecked	Unchecked *Unless collecting vertical data
GPS Height		
Antenna Height	0	No Tripod: 0.21 ft Tripod: 4 ft
Geoid Separation	blank	blank
Use Map Units for Height Units	Checked	Checked
Datum		
GPS Datum	D_WGS_1984	D_WGS_1984

HDOP – horizontal dilution of precision; WAAS – Wide Area Augmentation System; WGS_1984 – World Geodetic System of 1984

Table 2 – GPS Correct Setup Menu

Field	Default or Trimble Recommended	FES Standard
Logging Settings		
Log GPS to SSF	On	On
Antenna Height	0.000 m	0.063 m Type: GeoXH Internal *Unless using external antenna
GPS(GNSS) Settings		
Accuracy Settings:	NA	<ul style="list-style-type: none"> • <u>Accuracy Value:</u> <ul style="list-style-type: none"> • Placing Pin Flags - Horiz; Drop Down to “In the Field” • Collecting Features - Horiz; Drop Down to “Postprocessed” • <u>Base Distance (if PP):</u> <200km • <u>Base Data:</u> GPS (6000 only)
Productivity–Precision Slider Bar	NA	Middle (Max PDOP reads 6.0, Max SNR reads 39.0)
Use Smart Settings (6000 only)	Checked	Checked
Velocity Filter (2005/2008)	Off	Auto (provides better accuracy in high multipath conditions)
Use GLONASS (2005/2008)		No
Real-Time Settings		
Choice 1:		Integrated SBAS Tracking Mode: Auto
Choice 2:		Use Uncorrected GNSS
Real-time Age Limit:		1 min

GLONASS/GNSS – global navigation satellite system; SBAS – satellite-based augmentation systems; SNR – signal to noise; SSF – standard storage format

Wireless Manager – GeoXH 6000

As a power saving measure, the wi-fi and Bluetooth connections should be turned off. These settings may be accessed through Start Menu > Setting > Connections Tab > Wireless Manager. Ensure all connections are turned off.

ArcPad Settings

Locations will be logged with the ArcPad mobile GPS software. In general, standard settings will be used.

Soft Reset

A soft reset should be performed on the GPS prior to data collection each day (similar to restarting the computer).

- For the GeoExplorer 2005-series GPS, a soft reset may be accomplished by holding the Power button down for 5 seconds. If that does not work, the power button may be held down for 15



seconds to perform a soft reset and turn off the handheld. Then press the Power button to turn it on again.

- On the GeoExplorer 2008-series GPS, a soft reset may be accomplished by lightly pressing the reset button. Alternatively, a soft reset may be accomplished by pressing the power key for one second until the *Power* menu appears and then tapping the **Soft Reset** button.
- For the GeoExplorer 6000, press the power key for one second until the *Power* menu appears and then tap the **Reset** button.

Feature Logging

General

Site features will be logged as points, lines, or polygons and stored with basic information including:

- location number or sample number (as appropriate);
- project name;
- time; and
- date.

The Spatial Data Standards for Facilities, Infrastructure, and Environment (SDSFIE) feature classes will be used for site features whenever possible.

GPS coordinates will be collected from at least one sample point multiple times to confirm the accuracy of the coordinates. Notes will be made in the field book when the GPS survey is started and when it is completed. The notes will describe the features that were surveyed, circumstances that may impact the quality of the survey (including vegetation, obstacles, etc.), and any technical issues encountered during the survey.

The length of time used to collect GPS data at each point will be included on the GPS field form. Point features will be collected for a total of thirty seconds in general conditions where good satellite geometry is maintained. If a high multipath environment is encountered, the following procedures should be followed:

- Set the GPS logging settings to 10 seconds.
- Move to an area where good satellite geometry may be obtained. Do not log a feature, but monitor GPS settings and maintain good geometry for 2-3 minutes.
- Move into the high multipath environment and complete the feature logging.
- Move back to the area where good satellite geometry was obtained, and do not log a feature, but continue to monitor GPS settings and maintain good geometry for 2-3 minutes.
- *Note that it is critical that every effort be made to ensure good satellite geometry before, during, and after feature logging.*

Antenna and Number of Satellites

Personnel will ensure that the antenna has a clear view of the sky and at least four satellites before collecting a site feature. Four satellites will be sufficient for data collection, but five satellites are



required for H-Star processing. The number of satellites that are locked into the antenna will be recorded on the field form (e.g. 4 of 9). When carrying the GPS to another location to collect positions, or collecting a line feature, the GPS antenna will be oriented with a clear view to the sky and with a constant elevation. This will maintain a good satellite lock and improve accuracy.

SBAS

In addition to maintaining connection with at least four satellites, every effort should be made to ensure the antenna obtains and then maintains the SBAS (WAAS) satellite during data collection. The WAAS satellite provides corrections that increase the real-time accuracy of the GPS. The WAAS satellite lock may be monitored through the **Skyplot** page of the **GPS Controller**. It is identified with an airplane next to a radio antenna.

Real-Time Data Quality Monitoring

FES personnel will monitor the accuracy displayed on the GPS field activities. Accuracy settings may be configured differently based on the activity completed. The accuracy shown on the GPS will be determined by the accuracy settings established in the GPS.

1. **Feature logging.** The accuracy settings are presented in Table 2, and include real-time corrections with the integrated SBAS and assumed post-processing accuracy using a single base station < 200 km from the site. These accuracy settings are conservative, as the post-processed accuracy of each point should be better than what is shown on the GPS unit in the field.
2. **Site layout.** The accuracy settings are presented in Table 2, and include real-time corrections with Horizontal – in-the-field accuracy, and integrated SBAS for in-the-field corrections. If WAAS-lock is not maintained, accuracy may be as poor as 3 meters.

Accuracy will be monitored using the GPS controller and recorded on the field form. If monitoring accuracy using integrated SBAS, accuracy should be less than 0.5 m prior to logging. If this accuracy cannot be obtained, adjustments will be made to improve the accuracy (rotating 90 or 180 degrees, completing an offset, etc.). If the required accuracy cannot be obtained, the positions will be collected, and the accuracy issues will be documented in the field book.

PDOP will also be monitored and recorded on the GPS field form. PDOP may be monitored using the status bar in ArcPad or in the GPS controller. The lower the PDOP, the higher the probability of accurate data. In general, PDOP less than 4 will result in very accurate data. PDOP ranging between 5 and 8 will yield acceptable data, and PDOP of 9 or greater will yield poor quality data. Every effort should be made to ensure low PDOP values during data collection, including utilizing the Trimble GPS planning tool, and practicing good GPS collection techniques. If PDOP less than 9 cannot be achieved, the position will be collected and appropriate notes will be made on the field form and in the field book.

Quality Control Feature Logging

Data quality is documented for each feature through post processing using GPSAnalyst. However, GPS performance will also be checked for quality control by comparing coordinates of the sample points collected multiple times (described in the feature logging section, above) for precision.



ALS Standard Operating Procedure

DOCUMENT TITLE:	SUBSAMPLING AND COMPOSITING OF SAMPLES
REFERENCED METHOD:	N/A
SOP ID:	GEN-SUBS
REVISION NUMBER:	6
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STANDARD OPERATING PROCEDURE

SOP No.: GEN-SUBS
Revision: 6
Effective: 04/01/2015
Page 1 of 22

SUBSAMPLING AND COMPOSITING OF SAMPLES

ALS-KELSO

SOP ID:	GEN-SUBS	Rev. Number:	6	Effective Date:	04/01/2015
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ANNUAL REVIEW

SIGNATURES BELOW INDICATE NO PROCEDURAL CHANGES HAVE BEEN MADE TO THE SOP SINCE THE APPROVAL DATE ABOVE. THIS SOP IS VALID FOR TWELVE ADDITIONAL MONTHS FROM DATE OF THE LAST SIGNATURE UNLESS INACTIVATED OR REPLACED BY SUBSEQUENT REVISIONS.

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SUBSAMPLING AND COMPOSITING OF SAMPLES

1. SCOPE AND APPLICATION

- 1.1. This standard operating procedure describes procedures for obtaining subsamples used for laboratory analysis. The procedure also describes general practices for making composite samples from multiple individual samples. Procedures are given for aqueous, soil, sediment, vegetation and miscellaneous matrices. The SOP does not apply to tissue samples. Procedures for tissue samples are described in the GEN-TISP and MET-TDIG SOPs.
- 1.2. The SOP describes routine, or default, procedures for samples that do not require VOC analyses. Handling of VOC samples is described in SOP VOC-5035. Program or project-specific requirements may differ from those described in the SOP. Samples analyzed by EPA CLP procedures are specifically excluded from this procedure, and will be handled according to the applicable SOW.
- 1.3. Multi-increment samples require special handling and subsampling procedures. In addition to routine procedures, this SOP also includes instructions for handling and sampling from multi-increment samples submitted to the laboratory.
- 1.4. This procedure does not apply to situations where the entire sample (container) is used for the analysis.

2. METHOD SUMMARY

- 2.1. Obtaining a representative analytical subsample from the field sample submitted is essential to providing meaningful data. The subsample must be taken to most closely reflect the predominant composition of the sample. For aqueous and liquid samples, this is usually accomplished by shaking or inverting the sample. For soil, sediment, powders, and other solids the procedures are more involved. Procedures for subsampling are based on the information given in the references listed.
- 2.2. Some projects may employ multi-increment (MI) sampling in the field. The primary objective of MI sampling is to control the certain statistical errors associated with discrete sampling. Some studies have shown that MI sampling, using 30+ sample increments within a decision unit (a defined field sampling area) may provide a more representative view of contaminant concentrations than traditional discrete sampling approaches. References listed provide additional background on MI sampling. When this approach is taken it is important that laboratory procedures are consistent with field procedures when taking samples.
- 2.3. Unique sample matrices such as vegetation, wood and wood chips, mechanical parts and filters, etc. pose additional challenges to obtaining representative samples. For these samples the laboratory staff should consult with the Project Manager to determine the subsampling strategy. These special situations will be handled on a case-by-case basis. Service requests should list any specific sample preparation required.

3. DEFINITIONS



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- 3.1. Sample – A portion of material taken from a larger quantity for the purpose of estimating properties or composition of the larger quantity (ASTM).
- 3.2. Subsample – A portion of a sample taken for the purpose of estimating properties or composition of the whole sample (ASTM).
- 3.3. Composite sample – A mixture of multiple samples or subsamples produced to result in one sample representative of multiple field samples.
- 3.4. Representative subsample – A subsample collected in such a manner that it reflects one or more characteristics of interest (as defined by the project objectives) of the laboratory sample from which it was collected (ASTM).
- 3.5. Multilayered sample – A sample consisting of two or more clearly differentiated components (ASTM).
- 3.6. Multi-increment sample (MIS) – A field sample consisting of multiple bulk containers from one decision unit (defined in a MIS sampling plan) submitted to the lab for subsampling into a representative sample for analysis. Also known as Incremental Sampling Methodology (ISM).

4. INTERFERENCES

- 4.1. When obtaining subsamples it is important to minimize any chances for sample contamination or cross-contamination between samples. Work should be performed in an organized and neat manner. Spilling of samples (from overfilled containers, etc.) should be minimized and spills cleaned up. Equipment and laboratory tools used with samples should be cleaned between samples to prevent cross-contamination.
- 4.2. Analysis-specific interferences are described in the applicable analytical SOP.

5. SAFETY

- 5.1. All appropriate safety precautions for handling solvents, reagents and samples must be taken when performing this procedure. This includes the use of personal protective equipment, such as, safety glasses, lab coat and the correct gloves.
- 5.2. Chemicals, reagents and standards must be handled as described in the ALS safety policies, approved methods and in MSDSs where available. Refer to the ALS Environmental, Health and Safety Manual and the appropriate MSDS prior to beginning this method.

6. SAMPLE COLLECTION, CONTAINERS, PRESERVATION AND STORAGE

- 6.1. Refer to the analytical SOP for sample collection preservation and storage of samples. Subsamples and composite samples held for later analysis should be preserved and stored in the same manner as specified for field samples.
- 6.2. MIS Projects



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- 6.2.1. Projects for MI samples may include additional instructions not found in the analytical SOP. The analyst should consult with the Project Manager, or refer to the Project Manager's instructions, prior to working with these samples.
- 6.2.2. LIMS test codes are used to specify which MIS-analytical tests are needed (e.g. ISM-PAH). These test codes will have holding times associated with them that will ensure the completion of the MIS work before the initial analytical holding times (e.g. sample extraction) lapse.

7. STANDARDS, REAGENTS, AND CONSUMABLE MATERIALS

- 7.1. Dichloromethane, acetone, and acetonitrile may be used during the noted procedures for cleaning and decontamination of equipment.

8. APPARATUS AND EQUIPMENT

- 8.1. Laboratory balance capable of weighing the desired sample mass. There are various makes and models of balances available for use, with each department having balances appropriate for its use. For weighing solids and non-aqueous liquids (wastes), use a top-loader balance. Ensure that the mass (sample + container) to be placed on the pan is within the calibration-verified range of the balance.
- 8.2. Wiley laboratory mill, Model 4. Operate the Wiley mill following the manufacturer's recommendations.
- 8.3. Sieve shakers.
- 8.4. Shatter box.
- 8.5. Mechanical mixer and/or shaker.
- 8.6. Stainless steel or Glass mixing bowl.
- 8.7. Metal or disposable spoons and spatulas.
- 8.8. Aluminum foil.
- 8.9. Weighing boats, plastic or aluminum
- 8.10. Clean sample containers and lids (various sizes) as specified in the applicable test SOP.
- 8.11. Common laboratory glassware/apparatus (beakers, flasks, pipets, syringes, etc.).
- 8.12. Multi-Increment Samples
 - 8.12.1. Flat spatula, modified to create sides perpendicular to the flat surface used to scoop.
 - 8.12.2. Flat stainless steel masons trowel
 - 8.12.3. Volatile sample containers.



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8.12.3.1. 250-500 milliliter (ml) narrow mouth, amber bottles (recommended)

8.12.3.2. 4-8 ounce (oz.) amber jars with Teflon lined septum lids

8.12.4. Large stainless steel spoon or scoop

8.12.5. Large clean containers (a large stainless steel or glass bowl, Ziploc bags, or 5-gallon bucket)

8.12.6. #10 (2mm) sieve

8.12.7. Stainless steel cookie sheet or other tray.

9. PREVENTIVE MAINTENANCE

9.1. No preventive maintenance is required other than normal glassware and apparatus cleaning.

10. RESPONSIBILITIES

10.1. It is the responsibility of the analyst to perform the analysis according to this SOP and to complete all documentation required for data review. Analysis and interpretation of the results are performed by personnel in the laboratory who have demonstrated the ability to generate acceptable results utilizing this SOP. This demonstration is in accordance with the training program of the laboratory. Final review and sign-off of the data is performed by the department supervisor/manager or designee.

10.2. It is the responsibility of the department supervisor/manager to document analyst training and method proficiency, as described in ADM-TRAIN, *ALS-Kelso Training Procedure*.

11. PROCEDURE

11.1. Aqueous samples - Subsampling

11.1.1. Examine the sample. Thoroughly mix all samples by vigorous shaking. Immediately open the container and obtain the subsample. Additional filtering of the subsample may be required by the analytical SOP.

11.1.2. If the sample is multi-layered (a water layer with a sand/sediment layer that cannot be mixed or non-aqueous liquid layer) the Project Manager should be consulted on how to proceed with the sample. Additional analyses or sample preparations may be necessary depending on the client's data needs. Document the condition of the sample and decision made on subsampling.

11.2. Aqueous samples - Compositing

11.2.1. The customer may require compositing based on flow rates to create a flow proportional composite. The compositing instructions are included with the Form V or other project specification. Equal volume compositing is assumed if there are no specific instructions provided for compositing ratios.



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- 11.2.2. Setup the necessary glassware and/or sample container receiving the composite sample. Ensure that proper measuring glassware is used, typically a graduated cylinder or volumetric flask for larger volumes and pipet or syringe for smaller volumes.
- 11.2.3. Working quickly, mix the individual samples (as described above), open the container(s) and obtain the composite aliquot. Add each aliquot to the composite container and cap between samples.
- 11.2.4. Once all composite aliquots are obtained, cap and mix the composite sample. Label the container appropriately. Complete all documentation necessary to describe the compositing procedure, including samples used, aliquot taken, etc.
- 11.3. General considerations – Non-liquid samples
- 11.3.1. The analyst must first understand what the sample matrix of interest is. The project information should be consulted. If the sample appears to be homogeneous (other than extraneous materials described below) particle size reduction is not necessary. Particle size reduction should be performed only when required by the project QAPP, project specifications, or client request. If particle size reduction is required, use the appropriate apparatus (Wiley mill, shatter box, etc.) to perform crushing, grinding, milling, or sieving, and document. Refer to ASTM D6323 for guidelines on performing particle size reduction.
- 11.3.2. Once the matrix of interest is known, examine the sample for presence of extraneous material. The default procedure is to remove these items, or not include in the representative subsample. However, the presence of these materials should be documented in lab records and the Project Manager should be consulted prior to subsampling. Some examples are given below.
- Soil, solid, and sediment samples may include such material as larger rocks, sticks, leaves, pieces of metal, man-made materials, etc.
 - Wood or bark samples may include chunks of soil, mud, rocks, etc.
 - Vegetation samples may include chunks of soil, mud, rocks, sticks (not of the sample type, etc.).
 - Sediment samples may include rocks, twigs, vegetation, organisms, etc.
 - Sediment/marine projects, organisms are typically analyzed under separate sampling and analysis plans.
 - Mechanical parts, filters, etc., may include chunks of soil, mud, rocks, sticks, etc.
- 11.3.3. Examine soil samples to determine if the sample contains significant amounts of water. If the amount of water is greater than approximately 30%, treat the sample as a sediment sample.
- 11.3.4. Samples which are especially heterogeneous, as well as various special matrices, may require additional preparation. These will be handled on a case-by-case basis after consultation with the appropriate supervisors and Project Manager. Unique matrices for TCLP and other leaching procedures should be handled according to the applicable SOP or reference method.



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11.4. Soil/solid Samples

11.4.1. Subsampling samples in jars

11.4.1.1. Using a spatula or other utensil made of an inert material, thoroughly mix and homogenize the sample, making sure to loosen sample from the sides of the container, and continue mixing the entire contents, breaking up soil clumps, etc., until there is no visible segregation of the sample by layer, grain size, color, etc. The sample should appear uniform in color and texture.

11.4.1.2. Once mixed, remove the desired mass of sample for the analysis and document accordingly. Recap the jar and return to storage.

11.4.2. Subsampling samples in sleeves (core samples) and large bulk containers.

11.4.2.1. Empty samples in sleeves into a metal or glass homogenizing container and thoroughly stir using a spatula or other utensil. When homogenized the appropriate sample portions are placed in jars. Perform additional drying and grinding only when specified for the project. Client specifications for drying and grinding will be communicated by the Project Manager.

11.4.2.2. When working with sleeves and resulting homogenized samples or subsamples, always double-check the sample ID on the sleeve against the sample numbers on the samples.

11.4.3. Compositing soil/solid samples

11.4.3.1. Thoroughly mix each individual sample as described above.

11.4.3.2. Combine equal masses from each of the individual samples into a clean stainless steel mixing bowl. The amount used will depend upon the number of analyses to be performed on the composite and/or the amount available. The analyst preparing the composite will document the mass of each individual sample used for the composite, the date and time of compositing, and any other pertinent observations.

11.4.3.3. Thoroughly homogenize the sample using a spatula or other utensil and returned to clean glass jars. The sample container is labeled as a composite and with the sample identification, dated, and initialed.

11.4.3.4. Return the composite sample and remaining individual samples to storage.

11.5. Sediment Samples - Subsampling

11.5.1. Standard procedure calls for mixing overlying water into the sample. EPA SW-846 methods for organic extractions specify to decant and discard overlying water. However, the Puget Sound Protocols and others have options for decanting and discarding this water, decanting and performing a separate water analysis, or mixing the water into the sample. The analyst should confirm which option is to be used on the sample. For projects not within the scope of the Puget Sound Protocols or similar project plans, the overlying water should be decanted and discarded for organics analysis. For metals and inorganics, mix the overlying water into the sample.



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Note: If water is decanted and discarded and percent solids is to be applied or determined, a separate solids determination must be made on the decanted sample.

- 11.5.2. Thoroughly mix and homogenize the sample, making sure to mix the entire contents of the jar. Additional steps may be needed to homogenize the sample (break up soil clumps, etc.). The sample should be mixed so there is a uniform color and texture. See section 11.4.1.1.

Note: Sediment samples may contain considerable amounts of organics matter. Ensure that samples are thoroughly mixed. Document the presence of substantial organic matter, shells, etc.

- 11.5.3. Once mixed, remove the desired mass of sample for the analysis and document accordingly. Recap the jar and return to storage.
- 11.5.4. The subsample is transferred to an appropriate, labeled container. The sample container is stored in the appropriate refrigerator in sample receiving and any empty sleeve can be stored at room temperature.

11.6. Sediment Samples - Compositing

- 11.6.1. Thoroughly mix each individual sample as described above.
- 11.6.2. Combine equal masses from each of the individual samples into a clean stainless steel mixing bowl. The amount used will depend upon the number of analyses to be performed on the composite and/or the amount available. The analyst preparing the composite will document the mass of each individual sample used for the composite, the date and time of compositing, and any other pertinent observations.

Note: Equal masses are used unless otherwise instructed. It may be required to use the entire jar or other measure.

- 11.6.3. The sample is thoroughly homogenized using a spatula or other utensil and returned to clean glass jars. The sample container is labeled as a composite and with the sample identification, dated, and initialed.
- 11.6.4. The composite sample and remaining individual samples are returned to storage.
- 11.6.5. Samples should be received prepared from the field as sample increments. Although unlikely, in cases where proper preparation of increments from large bulk samples does not occur in the field, the following steps will be taken.
 - 11.6.5.1. When obtaining sample increments from a large bulk container (bucket, large jar, large bag, etc.) be sure to sample from the center and remove the soil 1-2 inches deep. Using the large spoon or scoop, collect the sample increment according to the work plan. Scoop approximately 30-60 grams into a large, clean container and move on to the next sample increment location. Be cautious of oversize material, which means more mass may need to be taken from each increment to end with the 30-50 g sub-sample after sieving (a 5 kg field sample may not be uncommon). Increments can be sieved directly into the bucket, or they can be bagged and sieved later.



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- 11.7. Multi-Incremental Sampling (or Incremental Sampling Methodology (ISM)) – When laboratory subsampling using MIS/ISM is to be used to produce the analytical subsample(s), the following procedures are used.

NOTE: Section 11.7.1 lists the default procedure that is to be used when no other client or project specifications or modifications are given. This section refers to two tables – one specifying default increment amounts for analytical and one listing a “large mass” option that is to be used only when project specified. Section 11.7.2 describes the procedures to be used when the State of Hawaii DOH protocol is specified. Section 11.7.3 describes procedures for analysis method 8330B.

If, after reviewing the project and Service Request information, the analyst has any uncertainty of the MIS approach to take, they must confirm with the Project Manager the protocol to be used.

11.7.1. Default procedure

- 11.7.1.1. After the 30-50 sample increments have been field collected into a container (a 5 kg field sample may not be uncommon) air dry the entire sample (all received containers) in aluminum pans pre-rinsed 3 times with DCM (dichloromethane/methylene chloride). Note, if Aluminum is a target analyte of interest then substitute the aluminum pans for glass or stainless steel. Air drying may take 2-4 days with occasional stirring.
- 11.7.1.2. The intent of air drying is to convert the sample to a more manageable form prior to sieving. The sample is considered air-dried when the material appears dry enough to enable disaggregation and sieving. Due to high variability of laboratory samples, sample dryness should be confirmed by a senior analyst or supervisor prior to going further with the procedure.
- 11.7.1.3. Rinse all utensils and equipment with DCM three times prior to use (stainless steel tray, mortar & pestle, 2mm sieve & catch pan, trowel, ISM spatula).
- 11.7.1.4. Lightly grind the air dried sample with a mortar & pestle in order to break up dirt and clay chunks (do not size reduce rocks or vegetation) and pass sample through a 2mm sieve.
- 11.7.1.5. Weigh the remaining +2mm fraction in an appropriate sized jar and record the weight on the ISM bench sheet. Describe the +2mm fraction on the bench sheet (size of rocks, type of any vegetation, etc.).
- 11.7.1.6. Weigh and record the weight of the -2mm fraction.
- 11.7.1.7. Mix the sample, dump on a DCM-rinsed stainless steel pan, and spread the sample out with a trowel, forming a rectangle no more than 1cm deep.
- 11.7.1.8. Divide the sample into a minimum of 30 equal sections (30 to 50 sections is recommended) using the trowel blade. Note that the entire sample should be included in the grid and amount of sample ‘outside’ the grid outer edges



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minimized (however, do not overly manipulate the sample in an attempt to create a perfect grid).

11.7.1.8.1. Collect an equal (approximate) amount of sample from each of the sections based on the applicable table (Table 1 or Table 2) and place into a labeled container (see Tables 1 and 2). Scrape the modified flat spatula along the bottom of the tray and pull straight up to make sure all depths and particle sizes are represented in the collection area. Avoid collecting portions from the edge of gridlines (where the slab has been disturbed). Record the exact final weight of sample for each test on the ISM bench sheet and on the jar. Metals tests should be weighed on an analytical balance. All larger amounts can be done on a 2-place balance.

11.7.1.8.2. Since each laboratory area must analyze the entire contents of the prepared (or submitted) jar, the subsampling process must be repeated for each separate analysis to be performed on the sample. The subsampling process must be performed for each individual QC sample as well. The entire mass in the jar will be analyzed (TOC is the exception). The results may be less defensible if only a subsample or fraction of the jar contents is analyzed.

11.7.1.8.3. If sample amount is sufficient, it is recommended to repeat the process to obtain a backup sample in the event that re-analysis is required. This 'As Received' backup is placed back in the original sample jar and returned to sample management/custody.

11.7.1.9. Labeling and storage

11.7.1.9.1. Refer to Table 3 for default storage conditions, which are based on how the MIS sample was prepared and on the stability/volatility of target analytes.

11.7.1.9.2. MIS subsamples do not need to be returned to SMO for barcode labeling. Label the sub-aliquots with LIMS sample labels and deliver them to the designated storage areas for each lab section performing analysis. Document the internal custody transfer in a logbook, on the benchsheet, or similar fashion.

11.7.1.9.3. Place any remaining -2mm sample into jars labeled as "-2mm archive." If there are multiple jars, label them as "1 of 3", "2 of 3", etc. All remaining bulk sample jars must be returned to SMO for barcode labeling and storage.

Usually, the -2mm archive and test archive (back-up samples) jars are placed in a freezer, while the +2mm archive and test jars (with QC) are placed on the room temperature shelves.

11.7.2. Procedure for ISM following State of Hawaii DOH Protocol (see references)

11.7.2.1. Samples requesting the Hawaii DOH procedure require wet and/or dry sieving depending on the test/analytes for which subsamples are being



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prepared. Refer to a copy of the Hawaii DOH procedure and/or the Project Manager for details before beginning.

11.7.2.2. Obtain instructions from the Project Manager or Service Request for increment amounts and test subsample amounts. Also refer to the *Technical Guidance Manual for the Implementation of the Hawaii State Contingency Plan*, November 12, 2008, Section 4.2.2 for guidance on increment/sample amounts.

11.7.2.3. Subsample bulk MI samples to be tested for SVOCs, including TPH-D, some PAHs, and Mercury, unstable pesticides, should be subsampled without drying or sieving in order to minimize chemical loss or alteration and meet holding times for analysis. Refer to Table 2a. of *Technical Guidance Manual Notes: Decision Unit and Multi-Increment Sample Investigations*, March 2011, State of Hawaii, Department of Health, Reference document number 2011-143-RB.

11.7.2.4. If both SVOC and non-volatile PAHs are targeted contaminants of interest then include testing for both in laboratory subsamples collected from the multi-Increment sample prior to drying and sieving.

11.7.2.5. For wet ISM aliquots, organic tests (SVG/SVM) require a larger aliquot size to accommodate for the extra water content. In most cases, low-level organic tests will require a 40g wet aliquot (max weight capacity for most tests) and normal level tests will require a 20g wet aliquot (double the target dry weight).

11.7.2.6. Use a separate sample from the wet material and test for soil moisture in order to convert analytical results to dry-weight basis.

11.7.2.7. Not all samples from Hawaii require the State of Hawaii DOH procedure. See service request and/or verify with the Project Manager.

11.7.3. Procedure for ISM on 8330B Explosives

11.7.3.1. Samples from Ammunition Depots and anywhere except Firing Ranges (not DOD)

11.7.3.1.1. Follow the basic ISM procedure, except all utensils/pans need rinsed 3 times with Acetonitrile (instead of DCM). Collect a 10.00g aliquot and place in a 4oz amber jar (explosives are sunlight sensitive).

11.7.3.2. Samples from Firing Ranges

11.7.3.2.1. Grinding: For firing ranges, the entire -2mm portion collected from the sieving procedure must be ground to a powder in the shatter box.

11.7.3.3. Method 8330B DOD samples



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- 11.7.3.3.1.Grinding: For DOD work, the entire -2mm portion collected from the sieving procedure must be ground to a powder in the shatter box prior to proceeding. Note: high-speed milling, such as in the shatter box, can elevate sample temperature due to friction. The thermal stability of the target analytes should be considered when performing this grinding procedure. Method 8330 B specifies a 2-minute (or longer) cool down period between five 60-second grinding intervals to maintain acceptable temperatures and minimize loss of volatile energetic contaminants.
- 11.7.3.3.2. An SRM (supplied by the Organic LC instrument lab) must be taken through the grinding and ISM procedure (already dry so doesn't need to be air dried or sieved). Shatter box 50g to 100g of the well-mixed SRM, and then make a 10g aliquot after grinding. Place the aliquot in 4oz amber jar. Archive the remaining SRM in an amber jar.
- 11.7.3.3.3.Grinding Blank: Matrix sand blanks (use baked sand) must be ground in the shatter box between each sample and aliquoted following the ISM procedure. The blanks can be ground in equal portions and then recombined at the end to make one sample requiring one ISM aliquot procedure. (Example: To ISM a 200g portion for use in making the final 10g aliquot, divide 200g by the number of samples needing shatter box and grind that amount of matrix sand between each sample. Recombine all ground matrix sand at the end and ISM one 10g aliquot from the 200g of ground matrix sand.) Archive the remaining matrix sand in an amber jar.

11.8. Analyte-Specific Considerations

11.8.1. Metals

- 11.8.1.1.It has been proven that grinding can greatly improve the reproducibility for metals analyses. However, erosion of the metals surfaces used in grinding may contribute to a high bias in the samples. It is recommended that the tungsten carbide grinding mill is used when grinding soils in the shatter box thereby limiting the amount of potential bias in the prepared samples.
- 11.8.1.2.When grinding soil samples that may potentially contain ores of malleable metals (e.g. Lead, Copper, Tin) be aware that the malleable particles may tend to smear during grinding, and may be lost from the samples to equipment surfaces. This anomaly may bias sample results low, decontamination of equipment surfaces may be difficult and could result in high bias in subsequent samples from carry over.
- 11.8.1.3.Reproducibility for Lead analyses in unground, incrementally sampled (IS) samples from small arms firing ranges may have an unacceptable large variability. The large variability for Lead may be due to single particles of Lead between one and two millimeters in diameter being present in only some of the replicate splits. If the end data is to assess risk of accidental ingestion of Lead, precision for the concentration of lead contained in larger particles may be of less interest then the Lead contained in the finer, less than 0.25 mm, fraction. Using a finer mesh sieve (0.25 mm rather than 2



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mm) may improve precision and reproducibility. However, sieving unground samples through sieves finer than two millimeters is not appropriate if analyzing for high explosives or propellants. Typical mass sizes for energetic analytes are in particles sizes greater than 0.59 millimeters.

11.8.1.4. MI samples collected for Arsenic analyses that contain greater than 20 mg/K total Arsenic should be tested for bioaccessible Arsenic. This should be discussed with the project manager. If deemed appropriate, the entire <2mm fraction of the respective samples should be sieved to a ≤ 0.25 mm, representatively sub-sampled and analyzed for bioaccessible Arsenic using SBRC methodology, 1-2 grams are required.

11.8.2. Polycyclic Aromatic Hydrocarbons (PAHs)

Currently there is little information in published procedures specific to the laboratory processing of ISM samples for PAHs. The default procedure above is used, but the 8330B procedure is an acceptable option if specified.

11.8.3. Perchlorate

11.8.3.1. Currently there is little information in published procedures specific to the laboratory processing of ISM samples for Perchlorate. Laboratory processing of samples per EPA Method 8330B as described in Section 11.7.3 is recommended. A 10 gram sample is required for propellants and explosives. It is recommended that a 10 gram ISM sample should be extracted with 100mL of DI water for Perchlorate analysis by EPA Method 314.0.

11.9. Vegetation samples

Since vegetation samples often are not amenable to standard mixing and homogenization techniques, or because specific sections of the vegetation are targeted, these are handled on a case-by-case basis with instructions from the Project Manager. The PM will obtain sample-specific instructions from the client, and then communicate the specifications to the lab personnel using the ALS Form V or similar project specification document for the project. If the client makes reference to specific procedures, methods, or technical references, the PM will make the document(s) available to the laboratory personnel.

11.10. Paperboard samples

11.10.1. In general, prepare paperboard samples as described below. Project-specific instructions may replace these.

11.10.2. Review the Service Request and determine the jars you will need. In general, the jars needed are as follows:

Metals = 8 oz. jar.
Voa = 8 oz jar.
Dioxins = 8 oz jar.
SVG = 32 oz jar.
SVM = 32 oz jar.
PHC (8315) = 8 oz jar.
Gen Chem (not Biology) = 8 oz jar.



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11.10.3. Make sample labels according to test and put on appropriate jar.

11.10.4. If FDA Ext is on the Service Request for PHC you will need a 16 oz jar per sample. Do Not Composite into one sample. Each sample is a separate sample.

11.10.5. Prepare the FDA Ext first.

- Cut the sheet of paper into one 10" x 10" square.
- Cut the 10" x 10" into strips at the cut lines 7 ½, 5, and 2 ½.
- Cut the strips at the cut lines 7 ½, 5, and 2 ½. This will make 16 2" squares.
- Put each sample into its own jar and label accordingly. i.e. (1, 2 3, etc.); PHC will composite in the lab.

11.10.6. Put one sheet of paper into shredder, run the shredder back and forth to get the entire sample out. Use tongs to remove any remaining sample in bottom of shredder (make sure to turn off before you do this)

11.10.7. Shred equal amounts of each sample (1 or more sheets) to create the composite sample. Homogenize sample thoroughly and aliquot into each jar needed for analysis. Put sample storage on lid of jar.

11.10.8. Dioxins are sent out to Houston. Label the lid "Out".

11.10.9. Take all composites to Sample Management for ALS labeling and shelving.

11.10.10. Update composites as being done....Open Starlims, double click on Ad Hoc by Test (Under Results entry), highlight samples composited and click the Update to Done button at the top of page. Do not add jars when asked. Just click the X on the right hand corner.

12. QA/QC REQUIREMENTS

12.1. Ongoing QC Samples required for each sample batch (20 or fewer samples) are described in the SOP for Sample Batches and in the determinative SOPs.

13. DATA REDUCTION AND REPORTING

13.1. All compositing and subsampling data must be recorded into the bench records by the analyst. In addition to sample volumes and masses, sample identifications, etc., this should include descriptions of unique samples or sample components. Figure 1 shows the current MIS benchsheet template used to record MIS subsampling. Other project-specific benchsheets may apply.

13.2. It is the supervisor's responsibility to ensure that analytical data is reviewed and to ensure that all quality control requirements have been met.

14. CONTINGENCIES FOR HANDLING OUT-OF-CONTROL OR UNACCEPTABLE DATA

14.1. Refer to the SOP for *Nonconformity and Corrective Action* (CE-QA008) for corrective action procedures. Personnel at all levels and positions in the laboratory are to be alert to



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identifying problems and nonconformities when errors, deficiencies, or out-of-control situations are detected.

14.2. Handling out-of-control or unacceptable data

14.2.1. On-the-spot corrective actions that are routinely made by analysts and result in acceptable analyses should be documented as normal operating procedures, and no specific documentation need be made other than notations in laboratory maintenance logbooks, runlogs, for example. Table 4 lists typical actions taken.

14.2.2. Some examples when documentation of a nonconformity is required using a Nonconformity and Corrective Action Report (NCAR):

- Quality control results outside acceptance limits for accuracy and precision
- Method blanks or continuing calibration blanks (CCBs) with target analytes above acceptable levels
- Sample holding time missed due to laboratory error or operations
- Deviations from SOPs or project requirements
- Laboratory analysis errors impacting sample or QC results
- Miscellaneous laboratory errors (spilled sample, incorrect spiking, etc)
- Sample preservation or handling discrepancies due to laboratory or operations error

15. METHOD PERFORMANCE

15.1. Not applicable.

16. POLLUTION PREVENTION AND WASTE MANAGEMENT

16.1. The laboratory will comply with all Federal, State and local regulations governing waste management, particularly the hazardous waste identification rules and land disposal restrictions as specified in the ALS EH&S Manual.

16.2. It is the laboratory's practice to minimize the amount of solvents and reagents used to perform this method wherever technically sound, feasibly possible, and within method requirements. Standards are prepared in volumes consistent with laboratory use in order to minimize the volume of expired standards to be disposed of. The threat to the environment from solvents and/or reagents used in this method may be minimized when recycled or disposed of properly.

16.3. This method uses non-halogenated solvents and any waste generated from this solvent must be placed in the collection cans in the lab. The solvent will then be added to the hazardous waste storage area and disposed of in accordance with Federal and State regulations.

16.4. This method uses Dichloromethane and any waste generated from this solvent must be placed in the collection cans in the lab. The solvent will then be added to the hazardous waste storage area and recycled off site.

17. TRAINING

17.1. Training outline – Training Plan



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17.1.1. Review literature (see references section). Read and understand the SOP. Also review the applicable MSDS for all reagents and standards used. Following these reviews, observe the procedure as performed by an experienced analyst at least three times.

17.1.2. The next training step is to assist in the procedure under the guidance of an experienced analyst for a period of time. During this period, the analyst is expected to transition from a role of assisting, to performing the procedure with minimal oversight from an experienced analyst.

17.2. Training is documented following the SOP for *Documentation of Training*.

17.2.1. When the analyst training is documented by the supervisor on internal training documentation forms, the supervisor is acknowledging that the analyst has read and understands this SOP and that adequate training has been given to the analyst to competently perform the analysis independently.

18. METHOD MODIFICATIONS

18.1. Not applicable.

19. REFERENCES

- 19.1. Guidance for Obtaining Representative Laboratory Analytical Subsamples from Particulate Laboratory Samples, U.S. Environmental Protection Agency, EPA/600/R-03/027, November 2003.
- 19.2. Standard Guide for Laboratory Subsampling of Media Related to Waste Management Activities, ASTM D 6323, Annual Book of ASTM Standards, 1999.
- 19.3. Test Methods for Evaluating Solid Waste, EPA SW-846, Final Update III, December 1996.
- 19.4. Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound, January, 1996.
- 19.5. Draft Guidance on Multi-Increment Soil Sampling State of Alaska, Department of Environmental Conservation, March 2007.
- 19.6. Technical Guidance Manual for the Implementation of the Hawaii State Contingency Plan, November 12, 2008.
- 19.7. Technical Guidance Manual Notes: Decision Unit and Multi-Increment Sample Investigations, March 2011, State of Hawaii, Department of Health, 2011-143-RB.
- 19.8. Standard operating Procedure, In Vitro Method for Determination of Lead and Arsenic Bioavailability; Solubility/Bioavailability Research Consortium, Document 8601-102.011-0601-1099-RN01.
- 19.9. Figure 1: Multi Incremental Sampling Worksheet.



20. CHANGES SINCE THE LAST REVISION

- 20.1. Updated entire SOP to current ALS format and sections.
- 20.2. Corrected various typographical and grammatical errors, and similar minor changes made to improve readability.
- 20.3. Changed Project Manager to Project Manager throughout.
- 20.4. Section 3.6 – updated MIS definition to include ISM.
- 20.5. Section 6.2 – revised to add MIS holding time discussion.
- 20.6. Section 8.12.1 – revised to specify modified spatula with perpendicular sides.
- 20.7. Section 10.2 – New (default language added).
- 20.8. Section 11 – much of the section is reorganized with previous content to improve the relationship of topics and reading flow.
- 20.9. Section 11.7 – beginning note is new.
- 20.10. Section 11.7.1.2 – revised language on air drying completeness.
- 20.11. Section 11.7.1.8 – significant revision to improve association of topics and provide not detailed instructions. Moved Table from section to end of SOP.
- 20.12. Section 11.7.1.8 and 11.7.1.8.1 – revised to add detail to increment sampling technique.
- 20.13. Sections 11.7.1.9 – revised to implement new processes.
- 20.14. Section 11.7.2 – added note to see references.
- 20.15. Section 11.8.2 – revised to indicate default procedure.
- 20.16. Section 13 – updated to refer to MIS benchsheet in Figure 1 and use of other MIS sheets.
- 20.17. Section 14 – New (default format).
- 20.18. Section 15 – New (default format).
- 20.19. Section 16 – New (default format).
- 20.20. Section 17 – updated with default language.
- 20.21. Section 18 – New (default format).
- 20.22. Section 19 – Updated references to Hawaii DOH documents.
- 20.23. Table 1 – added default basis and container columns.
- 20.24. Table 2 – new table.
- 20.25. Table 3 – new table.
- 20.26. Figure 1 – updated.



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TABLE 1
Default Multi-Incremental Sampling Information

Test	Subsample Basis	Aliquot	Approximate Amount per Increment	Container	QC Requirement
Total Solids	Air Dried	15.00 g	0.50 g	2 oz. soil jar	DUP per 10
200.7 Metals	Air Dried	1.0000 g	0.0333 g	Metals digestion tube	DUP/MS per 10
6010 Metals	Air Dried	1.0000 g	0.0333 g	Metals digestion tube	DUP/MS per 20
200.8 Metals	Air Dried	1.0000 g	0.0333 g	Metals digestion tube	DUP/MS per 10
6020 Metals	Air Dried	1.0000 g	0.0333 g	Metals digestion tube	DUP/MS per 20
Mercury	Air Dried	0.5000 g	0.0167 g	Mercury digestion cup	DUP/MS per 20
8081 PEST	As Received	15.00 g	0.50 g	2 or 4 oz. soil jar	MS/DMS per 20
8081 PEST-LL	As Received	30.00 g	1.00 g	2 or 4 oz. soil jar	MS/DMS per 20
8082 PCB	Air Dried	15.00 g	0.50 g	2 or 4 oz. soil jar	MS/DMS per 20
8082 PCB-LL	Air Dried	30.00 g	1.00 g	2 or 4 oz. soil jar	MS/DMS per 20
8151	As Received	30.00 g	1.00 g	2 or 4 oz. soil jar	MS/DMS per 20
8270	As Received	30.00 g	1.00 g	2 or 4 oz. soil jar	MS/DMS per 20
8270 LL	As Received	20.00 g	0.67 g	2 or 4 oz. soil jar	MS/DMS per 20
PAH	As Received	10.00 g	0.33 g	2 or 4 oz. soil jar	MS/DMS per 20
PAH ULL	As Received	20.00 g	0.67 g	2 or 4 oz. soil jar	MS/DMS per 20
8290/Dioxin	Air Dried	15.00 g	0.50 g	2 or 4 oz. soil jar	MS/DMS per 20
8330B*	As Received	10.00 g	0.33 g	2 or 4 oz. soil jar	MS/DMS per 20
Diesel or Residual Range Organics (DRO, RRO)**	As Received	30.00 g	1.00 g	2 or 4 oz. soil jar	MS/DMS per 20
TOC	Air Dried	15.00 g	0.50 g	2 or 4 oz. soil jar	None
Backup Sample	As Received	30.00 g	1.00 g	Back into original jar	N/A

* For DOD projects refer to the DOD 8330B protocols.

** Alaska Methods AK102 and AK103 call for the extraction of from 10-30 g of sample material (soil). For MIS purposes, the minimum required amount of material per analysis is 30 g.

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TABLE 2
"Large Mass" Multi-Incremental Sampling Information

Test	Subsample Basis	Aliquot	Approximate Amount per Increment	Container	QC Requirement
Total Solids	Air Dried	15.00 g	0.50 g	2 oz. soil jar	DUP per 10
200.7 Metals	Air Dried	10.00 g	0.333 g	Metals digestion tube	DUP/MS per 10
6010 Metals	Air Dried	10.00 g	0.333 g	Metals digestion tube	DUP/MS per 20
200.8 Metals	Air Dried	10.00 g	0.333 g	Metals digestion tube	DUP/MS per 10
6020 Metals	Air Dried	10.00 g	0.333 g	Metals digestion tube	DUP/MS per 20
Mercury	Air Dried	5.00 g	0.167 g	Mercury digestion cup or 2 oz. soil jar	DUP/MS per 20
8081 PEST	As Received	15.00 g	0.50 g	2 or 4 oz. soil jar	MS/DMS per 20
8081 PEST-LL	As Received	30.00 g	1.00 g	2 or 4 oz. soil jar	MS/DMS per 20
8082 PCB	Air Dried	15.00 g	0.50 g	2 or 4 oz. soil jar	MS/DMS per 20
8082 PCB-LL	Air Dried	30.00 g	1.00 g	2 or 4 oz. soil jar	MS/DMS per 20
8151	As Received	30.00 g	1.00 g	2 or 4 oz. soil jar	MS/DMS per 20
8270	As Received	30.00 g	1.00 g	2 or 4 oz. soil jar	MS/DMS per 20
8270 LL	As Received	20.00 g	0.67 g	2 or 4 oz. soil jar	MS/DMS per 20
PAH	As Received	10.00 g	0.33 g	2 or 4 oz. soil jar	MS/DMS per 20
PAH ULL	As Received	20.00 g	0.67 g	2 or 4 oz. soil jar	MS/DMS per 20
8290/Dioxin	Air Dried	15.00 g	0.50 g	2 or 4 oz. soil jar	MS/DMS per 20
8330B*	As Received	10.00 g	0.33 g	2 or 4 oz. soil jar	MS/DMS per 20
Diesel or Residual Range Organics (DRO, RRO)**	As Received	30.00 g	1.00 g	2 or 4 oz. soil jar	MS/DMS per 20
TOC	Air Dried	15.00 g	0.50 g	2 or 4 oz. soil jar	None
Backup Sample	As Received	30.00 g	1.00 g	Back into original jar	N/A

* For DOD projects refer to the DOD 8330B protocols.

** Alaska Methods AK102 and AK103 call for the extraction of from 10-30 g of sample material (soil). For MIS purposes, the minimum required amount of material per analysis is 30 g.

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TABLE 3
Storage of Multi-Incremental Subsamples

Test	Storage
Total Solids	Room Temperature
200.7 Metals	Room Temperature
6010 Metals	Room Temperature
200.8 Metals	Room Temperature
6020 Metals	Room Temperature
Mercury	Room Temperature
8081 PEST	4 ± 2°C
8081 PEST-LL	4 ± 2°C
8082 PCB	Room Temperature
8082 PCB-LL	Room Temperature
8151	4 ± 2°C
8270	4 ± 2°C
8270 LL	4 ± 2°C
PAH	4 ± 2°C
PAH ULL	4 ± 2°C
8290/Dioxin	Room Temperature
8330B*	4 ± 2°C
Diesel or Residual Range Organics (DRO, RRO)*	4 ± 2°C
TOC	Room Temperature
Backup Sample	4 ± 2°C

* For DOD projects refer to the DOD 8330B protocols.



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FIGURE 1

Multi-Incremental Sampling Benchsheet Template

Service Request #:

Analysis: Multi Incremental Sampling (MIS/ISM)

Sample Number	+2mm Fraction Air Dried Weight (g)	Comments, Description of +2mm Fraction	-2mm Fraction Air Dried Weight (g)	-2mm Fraction Multi Incremental Sample Aliquots								Test	Sample Wt. (g)
				Test	Sample Wt. (g)	Test	Sample Wt. (g)	Test	Sample Wt. (g)	Test	Sample Wt. (g)		

Comments:

Balance ID: K-BALANCE- 42

Prepared By:	Date:
Reviewed By:	Date:

APPENDIX C
Random MI Sample Depths for Stockpiles

**Table C1 - Random MI Sample Depths Based on Thickness of Stockpile
Tanana River OB/OD Site (CC-FTWW-068)**

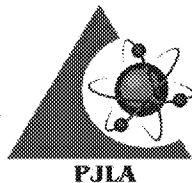
Cell ²	Random Number	Uniform Thickness of Stockpile ¹			
		2 Feet	3 Feet	4 Feet	5 Feet
1	0.81	2	2	3	4
2	0.73	1	2	3	4
3	0.03	0	0	0	0
4	0.13	0	0	1	1
5	0.08	0	0	0	0
6	0.50	1	1	2	2
7	0.88	2	3	4	4
8	0.18	0	1	1	1
9	0.84	2	3	3	4
10	0.91	2	3	4	5
11	0.48	1	1	2	2
12	0.28	1	1	1	1
13	0.99	2	3	4	5
14	0.02	0	0	0	0
15	0.93	2	3	4	5
16	0.34	1	1	1	2
17	1.00	2	3	4	5
18	0.57	1	2	2	3
19	0.30	1	1	1	2
20	0.37	1	1	1	2
21	0.32	1	1	1	2
22	0.60	1	2	2	3
23	0.78	2	2	3	4
24	0.64	1	2	3	3
25	0.76	2	2	3	4
26	0.16	0	0	1	1
27	0.41	1	1	2	2
28	0.00	0	0	0	0
29	0.60	1	2	2	3
30	0.45	1	1	2	2

Cell ²	Random Number	Uniform Thickness of Stockpile ¹			
		2 Feet	3 Feet	4 Feet	5 Feet
31	0.85	2	3	3	4
32	0.06	0	0	0	0
33	0.23	0	1	1	1
34	0.78	2	2	3	4
35	0.69	1	2	3	3
36	0.53	1	2	2	3
37	0.81	2	2	3	4
38	0.77	2	2	3	4
39	0.12	0	0	0	1
40	0.31	1	1	1	2
41	0.12	0	0	0	1
42	0.43	1	1	2	2
43	0.89	2	3	4	4
44	0.24	0	1	1	1
45	0.05	0	0	0	0
46	0.82	2	2	3	4
47	0.58	1	2	2	3
48	0.69	1	2	3	3
49	0.80	2	2	3	4
50	0.26	1	1	1	1
51	0.74	1	2	3	4
52	0.40	1	1	2	2
53	0.38	1	1	2	2
54	0.90	2	3	4	4
55	0.21	0	1	1	1
56	0.31	1	1	1	2
57	0.91	2	3	4	5
58	0.04	0	0	0	0
59	0.66	1	2	3	3
60	0.78	2	2	3	4

¹ Stockpiles will be spread out to a uniform thickness of between 2 and 5 feet thick.

² The number of cells will be determined in the field; the goal is to divide each stockpile into roughly 50 cells.

APPENDIX D
Laboratory Certifications



PERRY JOHNSON LABORATORY ACCREDITATION, INC.

Certificate of Accreditation

Perry Johnson Laboratory Accreditation, Inc. has assessed the Laboratory of:

ALS Environmental-Kelso
1317 South 13th Avenue, Kelso, WA 98626

(Hereinafter called the Organization) and hereby declares that Organization has met the requirements of ISO/IEC 17025:2005 "General Requirements for the competence of Testing and Calibration Laboratories" and the DoD Quality Systems Manual for Environmental Laboratories Version 5.0 July 2013 and is accredited in accordance with the:

United States Department of Defense Environmental Laboratory Accreditation Program (DoD-ELAP)

This accreditation demonstrates technical competence for the defined scope:
Environmental Testing
(As detailed in the supplement)

Accreditation claims for such testing and/or calibration services shall only be made from addresses referenced within this certificate. This Accreditation is granted subject to the system rules governing the Accreditation referred to above, and the Organization hereby covenants with the Accreditation body's duty to observe and comply with the said rules.

For PJLA:

Tracy Szerszen
President/Operations Manager

Initial Accreditation Date:

July 19, 2011

Issue Date:

February 13, 2016

Expiration Date:

February 28, 2018

Accreditation No.:

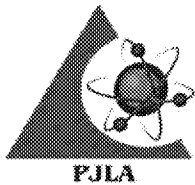
65188

Certificate No.:

L16-58

Perry Johnson Laboratory
Accreditation, Inc. (PJLA)
755 W. Big Beaver, Suite 1325
Troy, Michigan 48084

The validity of this certificate is maintained through ongoing assessments based on a continuous accreditation cycle. The validity of this certificate should be confirmed through the PJLA website: www.pjlabs.com



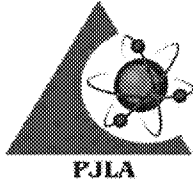
Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso
1317 South 13th Avenue, Kelso, WA 98626
Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous	EPA 1631E	CVAFS	Mercury (Low level)
Aqueous	EPA 1664A	Gravimetry	Hexane Extractable Material (HEM)
Aqueous	EPA 1664A	Gravimetry	Total Petroleum Hydrocarbons (TPH)
Aqueous	EPA 180.1	Nephelometer	Turbidity
Aqueous	EPA 2340B	Calculation by 6010	Hardness as CaCO ₃
Aqueous	EPA 245.1	CVAA	Mercury
Aqueous	EPA 300.0	IC	Bromide
Aqueous	EPA 300.0	IC	Chloride
Aqueous	EPA 300.0	IC	Fluoride
Aqueous	EPA 300.0	IC	Nitrate + Nitrite as N
Aqueous	EPA 300.0	IC	Nitrate as N
Aqueous	EPA 300.0	IC	Nitrite as N
Aqueous	EPA 300.0	IC	Sulfate
Aqueous	EPA 353.2	Automated Colorimetry	Nitrate + Nitrite as N
Aqueous	EPA 1632	HG-CT-GC-AAS	Arsenic (III)
Aqueous	EPA 1632	HG-CT-GC-AAS	Arsenic (V)
Aqueous	EPA 1632	HG-CT-GC-AAS	Total Inorganic Arsenic
Aqueous	EPA 7196A	Colorimetry	Chromium VI
Aqueous	EPA 7470A	CVAA	Mercury
Aqueous	EPA 8260C SIM	GC-MS	1,1,2,2-Tetrachloroethane
Aqueous	EPA 8260C SIM	GC-MS	1,1,2-Trichloroethane
Aqueous	EPA 8260C SIM	GC-MS	1,1-Dichloroethene
Aqueous	EPA 8260C SIM	GC-MS	1,2-Dibromoethane
Aqueous	EPA 8260C SIM	GC-MS	1,2-Dichloroethane
Aqueous	EPA 8260C SIM	GC-MS	1,3 Butadine
Aqueous	EPA 8260C SIM	GC-MS	1,4-Dichlorobenzene
Aqueous	EPA 8260C SIM	GC-MS	Bromodichloromethane
Aqueous	EPA 8260C SIM	GC-MS	Carbon Tetrachloride
Aqueous	EPA 8260C SIM	GC-MS	Chlorodibromomethane
Aqueous	EPA 8260C SIM	GC-MS	Chloroform
Aqueous	EPA 8260C SIM	GC-MS	Chloromethane
Aqueous	EPA 8260C SIM	GC-MS	cis-1,2-Dichloroethene
Aqueous	EPA 8260C SIM	GC-MS	Dichloromethane (Methylene Chloride)
Aqueous	EPA 8260C SIM	GC-MS	Tetrachloroethene
Aqueous	EPA 8260C SIM	GC-MS	trans-1,2-Dichloroethene



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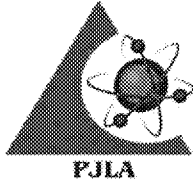
ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626
Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous	EPA 8260C SIM	GC-MS	Trichloroethene
Aqueous	EPA 8260C SIM	GC-MS	Vinyl chloride
Aqueous	EPA 9020B	Microcoulometric-titration detector	Total Organic Halides (TOX)
Aqueous	EPA 9040C	pH Meter	pH
Aqueous	EPA 9060A	TOC Meter	Total Organic Carbons (TOC)
Aqueous	SM 10200 H	Colorimetry	Chlorophyll-A
Aqueous	SM 2130B	Nephelometer	Turbidity
Aqueous	SM 2320B	Titrimetry	Total Alkalinity (as CaCO ₃)
Aqueous	SM 2510B	Conductivity Meter	Specific Conductance
Aqueous	SM 2540B	Balance	Solids, Total
Aqueous	SM 2540C	Balance	Solids, Total Dissolved
Aqueous	SM 2540D	Balance	Solids, Total Suspended
Aqueous	SM 4500-CN- G	Colorimetry	Cyanide, Amenable
Aqueous	SM 4500-P-E	Colorimetry	ortho-phosphorous
Aqueous	SM 4500-S2 D	Distillation Unit	Sulfide
Aqueous	SM 4500-CN E	Colorimetry	Total Cyanide
Aqueous	SM4500-NH3 G	Colorimetry	Ammonia
Aqueous	SM5220C	Titrimetry	Chemical Oxygen Demand (COD)
Aqueous	SM5310C	TOC Meter	Total Organic Carbons (TOC)
Aqueous	SOP-LCP-PFC	HPLC/MS/MS	6:2 Fluorotelomersulfonate
Aqueous	SOP-LCP-PFC	HPLC/MS/MS	8:2 Fluorotelomersulfonate
Aqueous	SOP-LCP-PFC	HPLC/MS/MS	N-Ethylperfluorooctanesulfonamide
Aqueous	SOP-LCP-PFC	HPLC/MS/MS	N-Ethylperfluorooctanesulfonamidoethanol
Aqueous	SOP-LCP-PFC	HPLC/MS/MS	N-Methylperfluorooctanesulfonamide
Aqueous	SOP-LCP-PFC	HPLC/MS/MS	N-Methylperfluorooctanesulfonamidoethanol
Aqueous	SOP-LCP-PFC	HPLC/MS/MS	Perfluoroheptanesulfonate
Aqueous	SOP-LCP-PFC	HPLC/MS/MS	Perfluorooctane Sulfonamide
Aqueous	SOP-LCP-PFC	HPLC/MS/MS	Perfluorotetradecanoic acid
Aqueous	SOP-LCP-PFC	HPLC/MS/MS	Perfluorotridecanoic
Drinking Water	EPA 504.1	GC-ECD	1,2-Dibromo-3-chloropropane (DBCP)
Drinking Water	EPA 504.1	GC-ECD	1,2-Dibromoethane (EDB)
Drinking Water	EPA 524.2	GC-MS	1,1,1,2-Tetrachloroethane
Drinking Water	EPA 524.2	GC-MS	1,1,1-Trichloroethane
Drinking Water	EPA 524.2	GC-MS	1,1,2,2-Tetrachloroethane
Drinking Water	EPA 524.2	GC-MS	1,1-Dichloroethane



Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

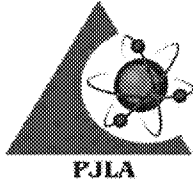
ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626

Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Drinking Water	EPA 524.2	GC-MS	1,1-Dichloroethene
Drinking Water	EPA 524.2	GC-MS	1,1-Dichloropropene
Drinking Water	EPA 524.2	GC-MS	1,2,3-Trichlorobenzene
Drinking Water	EPA 524.2	GC-MS	1,2,3-Trichloropropane
Drinking Water	EPA 524.2	GC-MS	1,2,4-Trichlorobenzene
Drinking Water	EPA 524.2	GC-MS	1,2,4-Trimethylbenzene
Drinking Water	EPA 524.2	GC-MS	1,2-Dibromoethane (EDB)
Drinking Water	EPA 524.2	GC-MS	1,2-Dichlorobenzene
Drinking Water	EPA 524.2	GC-MS	1,2-Dichloroethane
Drinking Water	EPA 524.2	GC-MS	1,2-Dichloropropane
Drinking Water	EPA 524.2	GC-MS	1,3,5-Trimethylbenzene
Drinking Water	EPA 524.2	GC-MS	1,3-Dichlorobenzene
Drinking Water	EPA 524.2	GC-MS	1,3-Dichloropropane
Drinking Water	EPA 524.2	GC-MS	1,4-Dichlorobenzene
Drinking Water	EPA 524.2	GC-MS	2,2-Dichloropropane
Drinking Water	EPA 524.2	GC-MS	2-Chlorotoluene
Drinking Water	EPA 524.2	GC-MS	4-Chlorotoluene
Drinking Water	EPA 524.2	GC-MS	4-Isopropyltoluene
Drinking Water	EPA 524.2	GC-MS	Benzene
Drinking Water	EPA 524.2	GC-MS	Bromobenzene
Drinking Water	EPA 524.2	GC-MS	Bromochloromethane
Drinking Water	EPA 524.2	GC-MS	Bromodichloromethane
Drinking Water	EPA 524.2	GC-MS	Bromoform
Drinking Water	EPA 524.2	GC-MS	Bromomethane
Drinking Water	EPA 524.2	GC-MS	Carbon Tetrachloride
Drinking Water	EPA 524.2	GC-MS	Chlorobenzene
Drinking Water	EPA 524.2	GC-MS	Chlorodibromomethane
Drinking Water	EPA 524.2	GC-MS	Chloroethane
Drinking Water	EPA 524.2	GC-MS	Chloroform
Drinking Water	EPA 524.2	GC-MS	Chloromethane
Drinking Water	EPA 524.2	GC-MS	cis-1,2-Dichloroethene
Drinking Water	EPA 524.2	GC-MS	cis-1,3-Dichloropropene
Drinking Water	EPA 524.2	GC-MS	Dibromomethane
Drinking Water	EPA 524.2	GC-MS	Dichlorodifluoromethane
Drinking Water	EPA 524.2	GC-MS	Dichloromethane (Methylene Chloride)
Drinking Water	EPA 524.2	GC-MS	Ethylbenzene



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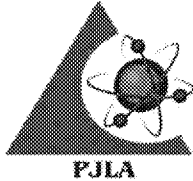
ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626
Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Drinking Water	EPA 524.2	GC-MS	Hexachlorobutadiene
Drinking Water	EPA 524.2	GC-MS	Isopropylbenzene
Drinking Water	EPA 524.2	GC-MS	m+p-Xylene
Drinking Water	EPA 524.2	GC-MS	Naphthalene
Drinking Water	EPA 524.2	GC-MS	n-Butylbenzene
Drinking Water	EPA 524.2	GC-MS	n-Propylbenzene
Drinking Water	EPA 524.2	GC-MS	o-Xylene
Drinking Water	EPA 524.2	GC-MS	sec-Butylbenzene
Drinking Water	EPA 524.2	GC-MS	Styrene
Drinking Water	EPA 524.2	GC-MS	tert-butylbenzene
Drinking Water	EPA 524.2	GC-MS	Tetrachloroethene
Drinking Water	EPA 524.2	GC-MS	Toluene
Drinking Water	EPA 524.2	GC-MS	trans-1,2-Dichloroethene
Drinking Water	EPA 524.2	GC-MS	trans-1,3-Dichloropropene
Drinking Water	EPA 524.2	GC-MS	Trichloroethene
Drinking Water	EPA 524.2	GC-MS	Trichlorofluoromethane (Freon 11)
Drinking Water	EPA 524.2	GC-MS	Vinyl chloride
Drinking Water	EPA 524.2	GC-MS	Xylenes, total
Solid	ASTM D4129-92M, Lloyd Kahn	TOC Meter	Total Organic Carbons (TOC)
Solid	EPA 160.3M	Gravimetry	Solids, Total
Solid	EPA 1631E	CVFAS	Mercury (low level)
Solid	EPA 7471A, B	CVAA	Mercury
Solid	EPA 9045D	pH Meter	pH
Solid	EPA 9056A	IC	Nitrate as N
Solid	EPA 9056A	IC	Nitrite as N
Solid	EPA 9071B	Gravimetry	Hexane Extractable Material (HEM)
Solid	GEN-AVS	Colorimetry	Acid Volatile Sulfides
Solid	GEN-NCEL	Colorimetry	Nitrocellulose
Solid	LCP-LCMS4	HPLC/MS/MS	1,3,5-Trinitrobenzene
Solid	LCP-LCMS4	HPLC/MS/MS	1,3-Dinitrobenzene
Solid	LCP-LCMS4	HPLC/MS/MS	2,4,6-Trinitrotoluene
Solid	LCP-LCMS4	HPLC/MS/MS	2,4-Dinitrotoluene
Solid	LCP-LCMS4	HPLC/MS/MS	2,6-Dinitrotoluene
Solid	LCP-LCMS4	HPLC/MS/MS	2-Amino-4,6-dinitrotoluene
Solid	LCP-LCMS4	HPLC/MS/MS	3,5-Dinitroaniline
Solid	LCP-LCMS4	HPLC/MS/MS	4-Amino-2,6-dinitrotoluene



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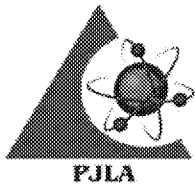
ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626
Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Solid	LCP-LCMS4	HPLC/MS/MS	HMX (Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine)
Solid	LCP-LCMS4	HPLC/MS/MS	Pentaerythritoltetranitrate
Solid	LCP-LCMS4	HPLC/MS/MS	RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)
Solid	LCP-LCMS4	HPLC/MS/MS	Tetryl (methyl-2,4,6-trinitrophenylnitramine)
Solid	LCP-Nitro	HPLC/MS/MS	2,4-Dinitrophenol
Solid	LCP-Nitro	HPLC/MS/MS	Picramic Acid
Solid	LCP-Nitro	HPLC/MS/MS	Picric Acid
Solid	PSEP	Gravimetry	Particle Size
Solid	SOP-GEN-AVS	Colorimetry	Acid Volatile Sulfides
Tissue	EPA 1631E	CVAFS	Mercury (low level)
Tissue	EPA 1632	HG-CT-GC-AAS	Arsenic (III)
Tissue	EPA 1632	HG-CT-GC-AAS	Arsenic (V)
Tissue	EPA 1632	HG-CT-GC-AAS	Total Inorganic Arsenic
Tissue	EPA 6010B, C/200.7	ICP	Aluminum
Tissue	EPA 6010B, C/200.7	ICP	Antimony
Tissue	EPA 6010B, C/200.7	ICP	Arsenic
Tissue	EPA 6010B, C/200.7	ICP	Barium
Tissue	EPA 6010B, C/200.7	ICP	Beryllium
Tissue	EPA 6010B, C/200.7	ICP	Boron
Tissue	EPA 6010B, C/200.7	ICP	Cadmium
Tissue	EPA 6010B, C/200.7	ICP	Calcium
Tissue	EPA 6010B, C/200.7	ICP	Chromium, total
Tissue	EPA 6010B, C/200.7	ICP	Cobalt
Tissue	EPA 6010B, C/200.7	ICP	Copper
Tissue	EPA 6010B, C/200.7	ICP	Iron
Tissue	EPA 6010B, C/200.7	ICP	Lead
Tissue	EPA 6010B, C/200.7	ICP	Magnesium
Tissue	EPA 6010B, C/200.7	ICP	Manganese
Tissue	EPA 6010B, C/200.7	ICP	Molybdenum
Tissue	EPA 6010B, C/200.7	ICP	Nickel
Tissue	EPA 6010B, C/200.7	ICP	Potassium
Tissue	EPA 6010B, C/200.7	ICP	Selenium
Tissue	EPA 6010B, C/200.7	ICP	Silver
Tissue	EPA 6010B, C/200.7	ICP	Sodium



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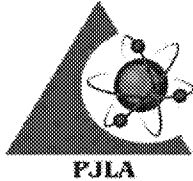
ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626
Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Tissue	EPA 6010B, C/200.7	ICP	Strontium
Tissue	EPA 6010B, C/200.7	ICP	Thallium
Tissue	EPA 6010B, C/200.7	ICP	Tin
Tissue	EPA 6010B, C/200.7	ICP	Titanium
Tissue	EPA 6010B, C/200.7	ICP	Vanadium
Tissue	EPA 6010B, C/200.7	ICP	Zinc
Tissue	EPA 6020A/200.8	ICP-MS	Aluminum
Tissue	EPA 6020A/200.8	ICP-MS	Antimony
Tissue	EPA 6020A/200.8	ICP-MS	Arsenic
Tissue	EPA 6020A/200.8	ICP-MS	Barium
Tissue	EPA 6020A/200.8	ICP-MS	Beryllium
Tissue	EPA 6020A/200.8	ICP-MS	Boron
Tissue	EPA 6020A/200.8	ICP-MS	Cadmium
Tissue	EPA 6020A/200.8	ICP-MS	Chromium, total
Tissue	EPA 6020A/200.8	ICP-MS	Cobalt
Tissue	EPA 6020A/200.8	ICP-MS	Copper
Tissue	EPA 6020A/200.8	ICP-MS	Iron
Tissue	EPA 6020A/200.8	ICP-MS	Lead
Tissue	EPA 6020A/200.8	ICP-MS	Manganese
Tissue	EPA 6020A/200.8	ICP-MS	Molybdenum
Tissue	EPA 6020A/200.8	ICP-MS	Nickel
Tissue	EPA 6020A/200.8	ICP-MS	Selenium
Tissue	EPA 6020A/200.8	ICP-MS	Silver
Tissue	EPA 6020A/200.8	ICP-MS	Strontium
Tissue	EPA 6020A/200.8	ICP-MS	Thallium
Tissue	EPA 6020A/200.8	ICP-MS	Tin
Tissue	EPA 6020A/200.8	ICP-MS	Titanium
Tissue	EPA 6020A/200.8	ICP-MS	Vanadium
Tissue	EPA 6020A/200.8	ICP-MS	Zinc
Tissue	EPA 7471A, B	CVAA	Mercury
Tissue	EPA 7742	AA, Borohydride Reduction; GFAA	Selenium
Tissue	EPA 8081A, B	GC-ECD	Aldrin
Tissue	EPA 8081A, B	GC-ECD	alpha-BHC
Tissue	EPA 8081A, B	GC-ECD	alpha-Chlordane
Tissue	EPA 8081A, B	GC-ECD	Chlordane (total)



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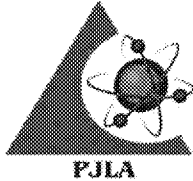
ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626
Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Tissue	EPA 8081A, B	GC-ECD	DDD (4,4)
Tissue	EPA 8081A, B	GC-ECD	DDE (4,4)
Tissue	EPA 8081A, B	GC-ECD	DDT (4,4)
Tissue	EPA 8081A, B	GC-ECD	delta-BHC
Tissue	EPA 8081A, B	GC-ECD	Dieldrin
Tissue	EPA 8081A, B	GC-ECD	Endosulfan I
Tissue	EPA 8081A, B	GC-ECD	Endosulfan II
Tissue	EPA 8081A, B	GC-ECD	Endosulfan sulfate
Tissue	EPA 8081A, B	GC-ECD	Endrin
Tissue	EPA 8081A, B	GC-ECD	Endrin aldehyde
Tissue	EPA 8081A, B	GC-ECD	Endrin ketone
Tissue	EPA 8081A, B	GC-ECD	gamma-BHC
Tissue	EPA 8081A, B	GC-ECD	gamma-Chlordane
Tissue	EPA 8081A, B	GC-ECD	Heptachlor
Tissue	EPA 8081A, B	GC-ECD	Heptachlor Epoxide (beta)
Tissue	EPA 8081A, B	GC-ECD	Methoxychlor
Tissue	EPA 8081A, B	GC-ECD	Toxaphene (total)
Tissue	EPA 8081B	GC-ECD	2,4-DDD
Tissue	EPA 8081B	GC-ECD	2,4-DDE
Tissue	EPA 8081B	GC-ECD	2,4-DDT
Tissue	EPA 8081B	GC-ECD	Chlorpyrifos
Tissue	EPA 8081B	GC-ECD	cis-Nonachlor
Tissue	EPA 8081B	GC-ECD	Hexachlorobenzene
Tissue	EPA 8081B	GC-ECD	Hexachloroethane
Tissue	EPA 8081B	GC-ECD	Hexchlorobutadiene
Tissue	EPA 8081B	GC-ECD	Isodrin
Tissue	EPA 8081B	GC-ECD	Mirex
Tissue	EPA 8081B	GC-ECD	Oxychlordane
Tissue	EPA 8081B	GC-ECD	trans-Nonachlor
Tissue	EPA 8082A	GC-ECD	2,2',3,3',4,4',5,5',6,6' Decachlorobiphenyl (PCB 209)
Tissue	EPA 8082A	GC-ECD	2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (PCB 206)
Tissue	EPA 8082A	GC-ECD	2,2',3,3',4,4',5,6-Octachlorobiphenyl (PCB 195)
Tissue	EPA 8082A	GC-ECD	2,2',3,3',4,4',5-Heptachlorobiphenyl (PCB 170)
Tissue	EPA 8082A	GC-ECD	2,2',3,3',4,4'-Hexachlorobiphenyl (PCB 128)
Tissue	EPA 8082A	GC-ECD	2,2',3,4,4',5,5'-Heptachlorobiphenyl (PCB 180)
Tissue	EPA 8082A	GC-ECD	2,2',3,4,4',5',6-Heptachlorobiphenyl (PCB 183)



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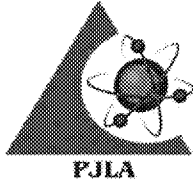
ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626

Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Tissue	EPA 8082A	GC-ECD	2,2',3,4,4',5'-Hexachlorobiphenyl (PCB 138)
Tissue	EPA 8082A	GC-ECD	2,2',3,4,4',6,6'-Heptachlorobiphenyl (PCB 184)
Tissue	EPA 8082A	GC-ECD	2,2',3,4,5'-Pentachlorobiphenyl (PCB 87)
Tissue	EPA 8082A	GC-ECD	2,2',3,4',5,5',6-Heptachlorobiphenyl (PCB 187)
Tissue	EPA 8082A	GC-ECD	2,2',3,4',5-Pentachlorobiphenyl (PCB 90)
Tissue	EPA 8082A	GC-ECD	2,2',3,5'-Tetrachlorobiphenyl (PCB 44)
Tissue	EPA 8082A	GC-ECD	2,2',4,4',5,5'-Hexachlorobiphenyl (PCB 153)
Tissue	EPA 8082A	GC-ECD	2,2',4,5,5'-Pentachlorobiphenyl (PCB 101)
Tissue	EPA 8082A	GC-ECD	2,2',5,6'-Tetrachlorobiphenyl (PCB 53)
Tissue	EPA 8082A	GC-ECD	2,2',5-Trichlorobiphenyl (PCB 18)
Tissue	EPA 8082A	GC-ECD	2,3,3',4,4',5,5'-Heptachlorobiphenyl (PCB 189)
Tissue	EPA 8082A	GC-ECD	2,3,3',4,4',5'-Hexachlorobiphenyl (PCB 157)
Tissue	EPA 8082A	GC-ECD	2,3,3',4,4',5-Hexachlorobiphenyl (PCB 156)
Tissue	EPA 8082A	GC-ECD	2,3,3',4,4',6-Hexachlorobiphenyl (PCB 158)
Tissue	EPA 8082A	GC-ECD	2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)
Tissue	EPA 8082A	GC-ECD	2,3,4,4',5-Pentachlorobiphenyl (PCB 114)
Tissue	EPA 8082A	GC-ECD	2,3,4,4'-Tetrachlorobiphenyl (PCB 60)
Tissue	EPA 8082A	GC-ECD	2,3',4,4',5,5' Hexachlorobiphenyl (PCB 167)
Tissue	EPA 8082A	GC-ECD	2,3',4,4',5',6-Hexachlorobiphenyl (PCB 168)
Tissue	EPA 8082A	GC-ECD	2,3',4,4',5-Pentachlorobiphenyl (PCB 118)
Tissue	EPA 8082A	GC-ECD	2,3',4,4',5-Pentachlorobiphenyl (PCB 123)
Tissue	EPA 8082A	GC-ECD	2,3',4,4'-Tetrachlorobiphenyl (PCB 66)
Tissue	EPA 8082A	GC-ECD	2,4,4'-Trichlorobiphenyl (PCB 28)
Tissue	EPA 8082A	GC-ECD	2,4'-Dichlorobiphenyl (PCB 8)
Tissue	EPA 8082A	GC-ECD	3,3',4,4',5,5'-Hexachlorobiphenyl (PCB 169)
Tissue	EPA 8082A	GC-ECD	3,3',4,4',5-Pentachlorobiphenyl (PCB 126)
Tissue	EPA 8082A	GC-ECD	3,3',4,4'-Tetrachlorobiphenyl (PCB 77)
Tissue	EPA 8082A	GC-ECD	3,4,4',5-Tetrachlorobiphenyl (PCB 81)
Tissue	EPA 8082A	GC-ECD	Aroclor 1016
Tissue	EPA 8082A	GC-ECD	Aroclor 1221
Tissue	EPA 8082A	GC-ECD	Aroclor 1232
Tissue	EPA 8082A	GC-ECD	Aroclor 1242
Tissue	EPA 8082A	GC-ECD	Aroclor 1248
Tissue	EPA 8082A	GC-ECD	Aroclor 1254
Tissue	EPA 8082A	GC-ECD	Aroclor 1260
Tissue	EPA 8082A	GC-ECD	Aroclor 1262



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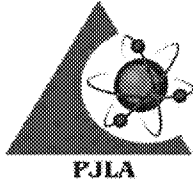
ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626
Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Tissue	EPA 8082A	GC-ECD	Aroclor 1268
Tissue	EPA 8270 SIM	GC-MS	PBDE 100
Tissue	EPA 8270 SIM	GC-MS	PBDE 128
Tissue	EPA 8270 SIM	GC-MS	PBDE 138
Tissue	EPA 8270 SIM	GC-MS	PBDE 153
Tissue	EPA 8270 SIM	GC-MS	PBDE 154
Tissue	EPA 8270 SIM	GC-MS	PBDE 17
Tissue	EPA 8270 SIM	GC-MS	PBDE 183
Tissue	EPA 8270 SIM	GC-MS	PBDE 190
Tissue	EPA 8270 SIM	GC-MS	PBDE 203
Tissue	EPA 8270 SIM	GC-MS	PBDE 206
Tissue	EPA 8270 SIM	GC-MS	PBDE 209
Tissue	EPA 8270 SIM	GC-MS	PBDE 28
Tissue	EPA 8270 SIM	GC-MS	PBDE 47
Tissue	EPA 8270 SIM	GC-MS	PBDE 66
Tissue	EPA 8270 SIM	GC-MS	PBDE 71
Tissue	EPA 8270 SIM	GC-MS	PBDE 85
Tissue	EPA 8270 SIM	GC-MS	PBDE 99
Tissue	EPA 8270 SIM PAH	GC-MS	2-Methylnaphthalene
Tissue	EPA 8270 SIM PAH	GC-MS	Acenaphthene
Tissue	EPA 8270 SIM PAH	GC-MS	Acenaphthylene
Tissue	EPA 8270 SIM PAH	GC-MS	Anthracene
Tissue	EPA 8270 SIM PAH	GC-MS	Benzo(a)anthracene
Tissue	EPA 8270 SIM PAH	GC-MS	Benzo(a)pyrene
Tissue	EPA 8270 SIM PAH	GC-MS	Benzo(b)fluoranthene
Tissue	EPA 8270 SIM PAH	GC-MS	Benzo(g,h,i)perylene
Tissue	EPA 8270 SIM PAH	GC-MS	Benzo(k)fluoranthene
Tissue	EPA 8270 SIM PAH	GC-MS	Chrysene
Tissue	EPA 8270 SIM PAH	GC-MS	Dibenzo(a,h)anthracene
Tissue	EPA 8270 SIM PAH	GC-MS	Fluoranthene
Tissue	EPA 8270 SIM PAH	GC-MS	Fluorene
Tissue	EPA 8270 SIM PAH	GC-MS	Indeno(1,2,3, cd)pyrene
Tissue	EPA 8270 SIM PAH	GC-MS	Naphthalene
Tissue	EPA 8270 SIM PAH	GC-MS	Phenanthrene
Tissue	EPA 8270 SIM PAH	GC-MS	Pyrene
Tissue	EPA 8270D SIM	GC-MS	1,2,4,5-Tetrachlorobenzene



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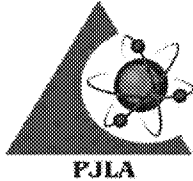
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ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626
Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Tissue	EPA 8270D SIM	GC-MS	1,2,4-Trichlorobenzene
Tissue	EPA 8270D SIM	GC-MS	1,2-Dichlorobenzene
Tissue	EPA 8270D SIM	GC-MS	1,3-Dichlorobenzene
Tissue	EPA 8270D SIM	GC-MS	1,4-Dichlorobenzene
Tissue	EPA 8270D SIM	GC-MS	2,3,4,6-Tetrachlorophenol
Tissue	EPA 8270D SIM	GC-MS	2,4,5-Trichlorophenol
Tissue	EPA 8270D SIM	GC-MS	2,4,6-Trichlorophenol
Tissue	EPA 8270D SIM	GC-MS	2,4-Dichlorophenol
Tissue	EPA 8270D SIM	GC-MS	2,4-Dimethylphenol
Tissue	EPA 8270D SIM	GC-MS	2,4-Dinitrophenol
Tissue	EPA 8270D SIM	GC-MS	2,4-Dinitrotoluene
Tissue	EPA 8270D SIM	GC-MS	2,6-Dinitrotoluene
Tissue	EPA 8270D SIM	GC-MS	2-Chloronaphthalene
Tissue	EPA 8270D SIM	GC-MS	2-Chlorophenol
Tissue	EPA 8270D SIM	GC-MS	2-Methyl-4,6-Dinitrophenol
Tissue	EPA 8270D SIM	GC-MS	2-Methylnaphthalene
Tissue	EPA 8270D SIM	GC-MS	2-Methylphenol
Tissue	EPA 8270D SIM	GC-MS	2-Nitroaniline
Tissue	EPA 8270D SIM	GC-MS	2-Nitrophenol
Tissue	EPA 8270D SIM	GC-MS	3,3-Dichlorobenzidine
Tissue	EPA 8270D SIM	GC-MS	3-Nitroaniline
Tissue	EPA 8270D SIM	GC-MS	4-Bromophenyl-phenylether
Tissue	EPA 8270D SIM	GC-MS	4-Chloro-3-methylphenol
Tissue	EPA 8270D SIM	GC-MS	4-Chloroaniline
Tissue	EPA 8270D SIM	GC-MS	4-Chlorophenyl-phenylether
Tissue	EPA 8270D SIM	GC-MS	4-Methylphenol (and/or 3-Methylphenol)
Tissue	EPA 8270D SIM	GC-MS	4-Nitroaniline
Tissue	EPA 8270D SIM	GC-MS	4-Nitrophenol
Tissue	EPA 8270D SIM	GC-MS	Acenaphthene
Tissue	EPA 8270D SIM	GC-MS	Acenaphthylene
Tissue	EPA 8270D SIM	GC-MS	Anthracene
Tissue	EPA 8270D SIM	GC-MS	Benzo(a)anthracene
Tissue	EPA 8270D SIM	GC-MS	Benzo(a)pyrene
Tissue	EPA 8270D SIM	GC-MS	Benzo(b)fluoranthene
Tissue	EPA 8270D SIM	GC-MS	Benzo(g,h,i)perylene
Tissue	EPA 8270D SIM	GC-MS	Benzo(k)fluoranthene



Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

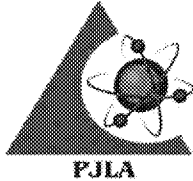
ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626

Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Tissue	EPA 8270D SIM	GC-MS	Benzoic acid
Tissue	EPA 8270D SIM	GC-MS	Benzyl alcohol
Tissue	EPA 8270D SIM	GC-MS	bis(2-Chloroethoxy)methane
Tissue	EPA 8270D SIM	GC-MS	bis(2-Chloroethyl)ether
Tissue	EPA 8270D SIM	GC-MS	bis(2-Chloroisopropyl)ether
Tissue	EPA 8270D SIM	GC-MS	bis(2-ethylhexy)phthalate
Tissue	EPA 8270D SIM	GC-MS	Butyl benzyl phthalate
Tissue	EPA 8270D SIM	GC-MS	Carbazole
Tissue	EPA 8270D SIM	GC-MS	Chrysene
Tissue	EPA 8270D SIM	GC-MS	Dibenzo(a,h)anthracene
Tissue	EPA 8270D SIM	GC-MS	Dibenzofuran
Tissue	EPA 8270D SIM	GC-MS	Diethyl phthalate
Tissue	EPA 8270D SIM	GC-MS	Dimethylphthalate
Tissue	EPA 8270D SIM	GC-MS	di-n-butylphthalate
Tissue	EPA 8270D SIM	GC-MS	Di-n-octylphthalate
Tissue	EPA 8270D SIM	GC-MS	Fluoranthene
Tissue	EPA 8270D SIM	GC-MS	Fluorene
Tissue	EPA 8270D SIM	GC-MS	Hexachlorobenzene
Tissue	EPA 8270D SIM	GC-MS	Hexachlorobutadiene
Tissue	EPA 8270D SIM	GC-MS	Hexachlorocyclopentadiene
Tissue	EPA 8270D SIM	GC-MS	Hexachloroethane
Tissue	EPA 8270D SIM	GC-MS	Indeno(1,2,3, cd)pyrene
Tissue	EPA 8270D SIM	GC-MS	Isophorone
Tissue	EPA 8270D SIM	GC-MS	Naphthalene
Tissue	EPA 8270D SIM	GC-MS	Nitrobenzene
Tissue	EPA 8270D SIM	GC-MS	N-Nitrosodimethylamine
Tissue	EPA 8270D SIM	GC-MS	N-Nitroso-di-n-propylamine
Tissue	EPA 8270D SIM	GC-MS	N-Nitrosodiphenylamine
Tissue	EPA 8270D SIM	GC-MS	Pentachlorophenol
Tissue	EPA 8270D SIM	GC-MS	Phenanthrene
Tissue	EPA 8270D SIM	GC-MS	Phenol
Tissue	EPA 8270D SIM	GC-MS	Pyrene
Tissue	EPA 8330B	HPLC	1,3,5-Trinitrobenzene
Tissue	EPA 8330B	HPLC	1,3-Dinitrobenzene
Tissue	EPA 8330B	HPLC	2,4,6-Trinitrotoluene
Tissue	EPA 8330B	HPLC	2,4-Dinitrotoluene



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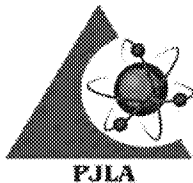
ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626
Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Tissue	EPA 8330B	HPLC	2,6-Dinitrotoluene
Tissue	EPA 8330B	HPLC	2-Amino-4,6-dinitrotoluene
Tissue	EPA 8330B	HPLC	2-Nitrotoluene
Tissue	EPA 8330B	HPLC	3,5-Dinitroaniline
Tissue	EPA 8330B	HPLC	3-Nitrotoluene
Tissue	EPA 8330B	HPLC	4-Amino-2,6-dinitrotoluene
Tissue	EPA 8330B	HPLC	4-Nitrotoluene
Tissue	EPA 8330B	HPLC	HMX (octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine)
Tissue	EPA 8330B	HPLC	Nitrobenzene
Tissue	EPA 8330B	HPLC	Nitroglycerin
Tissue	EPA 8330B	HPLC	Pentachloronitrobenzene
Tissue	EPA 8330B	HPLC	Pentaerythritoltetranitrate
Tissue	EPA 8330B	HPLC	RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)
Tissue	EPA 8330B	HPLC	Tetryl (methyl-2,4,6-trinitrophenylnitramine)
Tissue	OPPMS2	GC/MS/MS	Azinphos-methyl (Guthion)
Tissue	OPPMS2	GC/MS/MS	Chlorpyrifos
Tissue	OPPMS2	GC/MS/MS	Demeton O & S
Tissue	OPPMS2	GC/MS/MS	Diazinon
Tissue	OPPMS2	GC/MS/MS	Dichlorvos
Tissue	OPPMS2	GC/MS/MS	dimethoate
Tissue	OPPMS2	GC/MS/MS	Disulfoton
Tissue	OPPMS2	GC/MS/MS	Ethoprop
Tissue	OPPMS2	GC/MS/MS	Parathion, ethyl
Tissue	OPPMS2	GC/MS/MS	Parathion, methyl
Tissue	OPPMS2	GC/MS/MS	Phorate
Tissue	OPPMS2	GC/MS/MS	Ronnel
Tissue	OPPMS2	GC/MS/MS	Stirophos
Tissue	OPPMS2	GC/MS/MS	Sulfotepp
Tissue	SOC-Butyl	GC-FPD	Di-n-butyltin
Tissue	SOC-Butyl	GC-FPD	n-Butyltin
Tissue	SOC-Butyl	GC-FPD	Tetra-n-butyltin
Tissue	SOC-Butyl	GC-FPD	Tri-n-butyltin
Tissue	SOC-PESTMS2	GC/MS/MS	Aldrin
Tissue	SOC-PESTMS2	GC/MS/MS	Alpha-BHC
Tissue	SOC-PESTMS2	GC/MS/MS	beta-BHC
Tissue	SOC-PESTMS2	GC/MS/MS	DDD (4,4)



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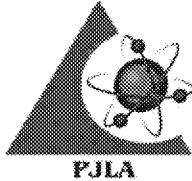
ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626

Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Tissue	SOC-PESTMS2	GC/MS/MS	DDE (4,4)
Tissue	SOC-PESTMS2	GC/MS/MS	DDT (4,4)
Tissue	SOC-PESTMS2	GC/MS/MS	delta-BHC
Tissue	SOC-PESTMS2	GC/MS/MS	Dieldrin
Tissue	SOC-PESTMS2	GC/MS/MS	Endosulfan I
Tissue	SOC-PESTMS2	GC/MS/MS	Endosulfan II
Tissue	SOC-PESTMS2	GC/MS/MS	Endosulfan sulfate
Tissue	SOC-PESTMS2	GC/MS/MS	Endrin
Tissue	SOC-PESTMS2	GC/MS/MS	Endrin aldehyde
Tissue	SOC-PESTMS2	GC/MS/MS	Endrin ketone
Tissue	SOC-PESTMS2	GC/MS/MS	gamma-BHC
Tissue	SOC-PESTMS2	GC/MS/MS	Heptachlor
Tissue	SOC-PESTMS2	GC/MS/MS	Heptachlor Epoxide (beta)
Tissue	SOC-PESTMS2	GC/MS/MS	Methoxychlor
Tissue	SOP LCP-LCMS4	HPLC/MS/MS	1,3,5-Trinitrobenzene
Tissue	SOP LCP-LCMS4	HPLC/MS/MS	1,3-Dinitrobenzene
Tissue	SOP LCP-LCMS4	HPLC/MS/MS	2,4,6-Trinitrotoluene
Tissue	SOP LCP-LCMS4	HPLC/MS/MS	2,4-Dinitrotoluene
Tissue	SOP LCP-LCMS4	HPLC/MS/MS	2,6-Dinitrotoluene
Tissue	SOP LCP-LCMS4	HPLC/MS/MS	2-Amino-4,6-dinitrotoluene
Tissue	SOP LCP-LCMS4	HPLC/MS/MS	3,5-Dinitroaniline
Tissue	SOP LCP-LCMS4	HPLC/MS/MS	4-Amino-2,6-dinitrotoluene
Tissue	SOP LCP-LCMS4	HPLC/MS/MS	HMX (octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine)
Tissue	SOP LCP-LCMS4	HPLC/MS/MS	Pentaerythritoltetranitrate
Tissue	SOP LCP-LCMS4	HPLC/MS/MS	RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)
Tissue	SOP LCP-LCMS4	HPLC/MS/MS	Tetryl (methyl-2,4,6-trinitrophenylnitramine)
Tissue	SOP LCP-Nitro	HPLC/MS/MS	2,4-Dinitrophenol
Tissue	SOP LCP-Nitro	HPLC/MS/MS	Picramic Acid
Tissue	SOP LCP-Nitro	HPLC/MS/MS	Picric Acid
Tissue	SOP-LCP-PFC	HPLC/MS/MS	Perfluorobutane Sulfonate
Tissue	SOP-LCP-PFC	HPLC/MS/MS	Perfluorobutanoic Acid
Tissue	SOP-LCP-PFC	HPLC/MS/MS	Perfluorodecane Sulfonate
Tissue	SOP-LCP-PFC	HPLC/MS/MS	Perfluorodecanoic Acid
Tissue	SOP-LCP-PFC	HPLC/MS/MS	Perfluorododecanoic Acid
Tissue	SOP-LCP-PFC	HPLC/MS/MS	Perfluoroheptanoic Acid
Tissue	SOP-LCP-PFC	HPLC/MS/MS	Perfluorohexane Sulfonate



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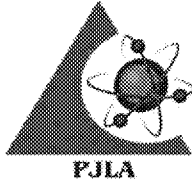
ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626
Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Tissue	SOP-LCP-PFC	HPLC/MS/MS	Perfluorohexanoic Acid
Tissue	SOP-LCP-PFC	HPLC/MS/MS	Perfluorononanoic Acid
Tissue	SOP-LCP-PFC	HPLC/MS/MS	Perfluorooctane Sulfonate
Tissue	SOP-LCP-PFC	HPLC/MS/MS	Perfluorooctanoic Acid
Tissue	SOP-LCP-PFC	HPLC/MS/MS	Perfluoropentanoic Acid
Tissue	SOP-LCP-PFC	HPLC/MS/MS	Perfluoroundecanoic Acid
Aqueous/Drinking Water	EPA 537	HPLC/MS/MS	Perfluorobutanesulfonic Acid
Aqueous/Drinking Water	EPA 537	HPLC/MS/MS	Perfluoroheptanoic Acid
Aqueous/Drinking Water	EPA 537	HPLC/MS/MS	Perfluorohexanesulfonic Acid
Aqueous/Drinking Water	EPA 537	HPLC/MS/MS	Perfluorononanoic Acid
Aqueous/Drinking Water	EPA 537	HPLC/MS/MS	Perfluorooctanesulfonic Acid
Aqueous/Drinking Water	EPA 537	HPLC/MS/MS	Perfluorooctanoic Acid
Aqueous/Solid	ASTM D 1426-93B	ISE	Nitrogen, Total Kjeldahl (TKN)
Aqueous/Solid	EPA 1020A	Closed Cup Flashpoint	Ignitability
Aqueous/Solid	EPA 1630	CVAFS	Methyl Mercury
Aqueous/Solid	EPA 314.0	IC	Perchlorate
Aqueous/Solid	EPA 350.1	Colorimetry	Ammonia
Aqueous/Solid	EPA 365.3	Colorimetry	Total Phosphorus
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Aluminum
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Antimony
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Arsenic
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Barium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Beryllium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Boron
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Cadmium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Calcium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Chromium, total
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Cobalt
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Copper
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Iron
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Lead
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Magnesium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Manganese
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Molybdenum
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Nickel
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Potassium



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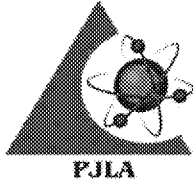
ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626
Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Selenium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Silver
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Sodium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Strontium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Thallium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Tin
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Titanium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Vanadium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Zinc
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Aluminum
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Antimony
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Arsenic
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Barium
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Beryllium
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Boron
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Cadmium
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Chromium, total
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Cobalt
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Copper
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Iron
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Lead
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Manganese
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Molybdenum
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Nickel
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Selenium
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Silver
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Strontium
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Thallium
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Tin
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Titanium
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Vanadium
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Zinc
Aqueous/Solid	EPA 6850	HPLC/MS/MS	Perchlorate
Aqueous/Solid	EPA 7742	AA, Borohydride Reduction; GFAA	Selenium
Aqueous/Solid	EPA 8011	GC-ECD	Ethylene Dibromide



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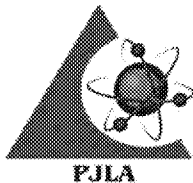
ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626
Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solid	EPA 8011	GC-ECD	1,2-Dibrom-3-chloropropane
Aqueous/Solid	EPA 8015C/AK103-RRO	GC-FID	Residual Range Organics (RRO)
Aqueous/Solid	EPA 8015C; AK101-GRO; NWTPH-Gx	GC-FID	Gasoline Range Organics (GRO)
Aqueous/Solid	EPA 8015C; AK102-DRO; NWTPH-Dx	GC-FID	Diesel Range Organics (DRO)
Aqueous/Solid	EPA 8081A, B	GC-ECD	Aldrin
Aqueous/Solid	EPA 8081A, B	GC-ECD	Alpha-BHC
Aqueous/Solid	EPA 8081A, B	GC-ECD	alpha-Chlordane
Aqueous/Solid	EPA 8081A, B	GC-ECD	Chlordane (total)
Aqueous/Solid	EPA 8081A, B	GC-ECD	DDD (4,4)
Aqueous/Solid	EPA 8081A, B	GC-ECD	DDE (4,4)
Aqueous/Solid	EPA 8081A, B	GC-ECD	DDT (4,4)
Aqueous/Solid	EPA 8081A, B	GC-ECD	delta-BHC
Aqueous/Solid	EPA 8081A, B	GC-ECD	Dieldrin
Aqueous/Solid	EPA 8081A, B	GC-ECD	Endosulfan I
Aqueous/Solid	EPA 8081A, B	GC-ECD	Endosulfan II
Aqueous/Solid	EPA 8081A, B	GC-ECD	Endosulfan sulfate
Aqueous/Solid	EPA 8081A, B	GC-ECD	Endrin
Aqueous/Solid	EPA 8081A, B	GC-ECD	Endrin aldehyde
Aqueous/Solid	EPA 8081A, B	GC-ECD	Endrin ketone
Aqueous/Solid	EPA 8081A, B	GC-ECD	gamma-BHC
Aqueous/Solid	EPA 8081A, B	GC-ECD	gamma-Chlordane
Aqueous/Solid	EPA 8081A, B	GC-ECD	Heptachlor
Aqueous/Solid	EPA 8081A, B	GC-ECD	Heptachlor Epoxide (beta)
Aqueous/Solid	EPA 8081A, B	GC-ECD	Methoxychlor
Aqueous/Solid	EPA 8081A, B	GC-ECD	Toxaphene (total)
Aqueous/Solid	EPA 8081B	GC-ECD	2,4-DDD
Aqueous/Solid	EPA 8081B	GC-ECD	2,4-DDE
Aqueous/Solid	EPA 8081B	GC-ECD	2,4-DDT
Aqueous/Solid	EPA 8081B	GC-ECD	Chlorpyrifos
Aqueous/Solid	EPA 8081B	GC-ECD	cis-Nonachlor
Aqueous/Solid	EPA 8081B	GC-ECD	Hexachlorobenzene
Aqueous/Solid	EPA 8081B	GC-ECD	Hexachlorobutadiene
Aqueous/Solid	EPA 8081B	GC-ECD	Hexachloroethane
Aqueous/Solid	EPA 8081B	GC-ECD	Isodrin



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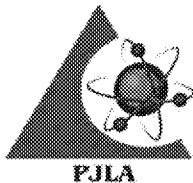
ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626
Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solid	EPA 8081B	GC-ECD	Mirex
Aqueous/Solid	EPA 8081B	GC-ECD	Oxychlorane
Aqueous/Solid	EPA 8081B	GC-ECD	trans-Nonachlor
Aqueous/Solid	EPA 8082A	GC-ECD	2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (PCB 206)
Aqueous/Solid	EPA 8082A	GC-ECD	2,2',3,3',4,4',5,6-Octachlorobiphenyl (PCB 195)
Aqueous/Solid	EPA 8082A	GC-ECD	2,2',3,3',4,4',5,5',6,6' Decachlorobiphenyl (PCB 209)
Aqueous/Solid	EPA 8082A	GC-ECD	2,2',3,3',4,4',5-Heptachlorobiphenyl (PCB 170)
Aqueous/Solid	EPA 8082A	GC-ECD	2,2',3,3',4,4'-Hexachlorobiphenyl (PCB 128)
Aqueous/Solid	EPA 8082A	GC-ECD	2,2',3,4,4',5,5'-Heptachlorobiphenyl (PCB 180)
Aqueous/Solid	EPA 8082A	GC-ECD	2,2',3,4,4',5,6-Heptachlorobiphenyl (PCB 183)
Aqueous/Solid	EPA 8082A	GC-ECD	2,2',3,4,4',5'-Hexachlorobiphenyl (PCB 138)
Aqueous/Solid	EPA 8082A	GC-ECD	2,2',3,4,4',6,6'-Heptachlorobiphenyl (PCB 184)
Aqueous/Solid	EPA 8082A	GC-ECD	2,2',3,4',5,5',6-Heptachlorobiphenyl (PCB 187)
Aqueous/Solid	EPA 8082A	GC-ECD	2,2',3,4,5'-Pentachlorobiphenyl (PCB 87)
Aqueous/Solid	EPA 8082A	GC-ECD	2,2',3,4',5-Pentachlorobiphenyl (PCB 90)
Aqueous/Solid	EPA 8082A	GC-ECD	2,2',3,5'-Tetrachlorobiphenyl (PCB 44)
Aqueous/Solid	EPA 8082A	GC-ECD	2,2',4,4',5,5'-Hexachlorobiphenyl (PCB 153)
Aqueous/Solid	EPA 8082A	GC-ECD	2,2',4,5,5'-Pentachlorobiphenyl (PCB 101)
Aqueous/Solid	EPA 8082A	GC-ECD	2,2',5,6'-Tetrachlorobiphenyl (PCB 53)
Aqueous/Solid	EPA 8082A	GC-ECD	2,2',5-Trichlorobiphenyl (PCB 18)
Aqueous/Solid	EPA 8082A	GC-ECD	2,3,3',4,4',5,5'-Heptachlorobiphenyl (PCB 189)
Aqueous/Solid	EPA 8082A	GC-ECD	2,3,3',4,4',5-Hexachlorobiphenyl (PCB 156)
Aqueous/Solid	EPA 8082A	GC-ECD	2,3,3',4,4',5'-Hexachlorobiphenyl (PCB 157)
Aqueous/Solid	EPA 8082A	GC-ECD	2,3,3',4,4',6-Hexachlorobiphenyl (PCB 158)
Aqueous/Solid	EPA 8082A	GC-ECD	2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)
Aqueous/Solid	EPA 8082A	GC-ECD	2,3',4,4',5,5' Hexachlorobiphenyl (PCB 167)
Aqueous/Solid	EPA 8082A	GC-ECD	2,3',4,4',5,6-Hexachlorobiphenyl (PCB 168)
Aqueous/Solid	EPA 8082A	GC-ECD	2,3,4,4',5-Pentachlorobiphenyl (PCB 114)
Aqueous/Solid	EPA 8082A	GC-ECD	2,3',4,4',5-Pentachlorobiphenyl (PCB 118)
Aqueous/Solid	EPA 8082A	GC-ECD	2,3',4,4',5-Pentachlorobiphenyl (PCB 123)
Aqueous/Solid	EPA 8082A	GC-ECD	2,3,4,4'-Tetrachlorobiphenyl (PCB 60)
Aqueous/Solid	EPA 8082A	GC-ECD	2,3',4,4'-Tetrachlorobiphenyl (PCB 66)
Aqueous/Solid	EPA 8082A	GC-ECD	2,4,4'-Trichlorobiphenyl (PCB 28)
Aqueous/Solid	EPA 8082A	GC-ECD	2,4'-Dichlorobiphenyl (PCB 8)
Aqueous/Solid	EPA 8082A	GC-ECD	3,3',4,4',5,5'-Hexachlorobiphenyl (PCB 169)
Aqueous/Solid	EPA 8082A	GC-ECD	3,3',4,4',5-Pentachlorobiphenyl (PCB 126)



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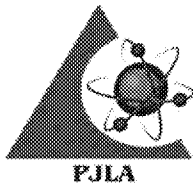
ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626
Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solid	EPA 8082A	GC-ECD	3,3',4,4'-Tetrachlorobiphenyl (PCB 77)
Aqueous/Solid	EPA 8082A	GC-ECD	3,4,4',5-Tetrachlorobiphenyl (PCB 81)
Aqueous/Solid	EPA 8082A	GC-ECD	Aroclor 1016
Aqueous/Solid	EPA 8082A	GC-ECD	Aroclor 1221
Aqueous/Solid	EPA 8082A	GC-ECD	Aroclor 1232
Aqueous/Solid	EPA 8082A	GC-ECD	Aroclor 1242
Aqueous/Solid	EPA 8082A	GC-ECD	Aroclor 1248
Aqueous/Solid	EPA 8082A	GC-ECD	Aroclor 1254
Aqueous/Solid	EPA 8082A	GC-ECD	Aroclor 1260
Aqueous/Solid	EPA 8082A	GC-ECD	Aroclor 1262
Aqueous/Solid	EPA 8082A	GC-ECD	Aroclor 1268
Aqueous/Solid	EPA 8151A	GC-ECD	2,4,5-T
Aqueous/Solid	EPA 8151A	GC-ECD	2,4,5-TP (Silvex)
Aqueous/Solid	EPA 8151A	GC-ECD	2,4-D
Aqueous/Solid	EPA 8151A	GC-ECD	2,4-DB
Aqueous/Solid	EPA 8151A	GC-ECD	Dalapon
Aqueous/Solid	EPA 8151A	GC-ECD	Dicamba
Aqueous/Solid	EPA 8151A	GC-ECD	Dichloroprop
Aqueous/Solid	EPA 8151A	GC-ECD	Dinoseb
Aqueous/Solid	EPA 8151A	GC-ECD	MCPA
Aqueous/Solid	EPA 8151A	GC-ECD	MCPP
Aqueous/Solid	EPA 8260B, C	GC-MS	1,1,1,2-Tetrachloroethane
Aqueous/Solid	EPA 8260B, C	GC-MS	1,1,1-Trichloroethane
Aqueous/Solid	EPA 8260B, C	GC-MS	1,1,2,2-Tetrachloroethane
Aqueous/Solid	EPA 8260B, C	GC-MS	1,1,2-Trichloroethane
Aqueous/Solid	EPA 8260B, C	GC-MS	1,1-Dichloroethane
Aqueous/Solid	EPA 8260B, C	GC-MS	1,2-Dibromoethane
Aqueous/Solid	EPA 8260B, C	GC-MS	1,2-Dichlorobenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	1,2-Dichloroethane
Aqueous/Solid	EPA 8260B, C	GC-MS	1,2-Dichloropropane
Aqueous/Solid	EPA 8260B, C	GC-MS	1,3,5-Trimethylbenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	1,3-Dichlorobenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	1,3-Dichloropropane
Aqueous/Solid	EPA 8260B, C	GC-MS	1,4-Dichlorobenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	1-phenylpropane
Aqueous/Solid	EPA 8260B, C	GC-MS	2,2-Dichloropropane



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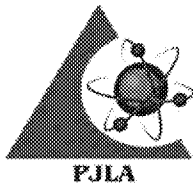
ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626
Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solid	EPA 8260B, C	GC-MS	2-Butanone (MEK)
Aqueous/Solid	EPA 8260B, C	GC-MS	2-Chloroethylvinylether
Aqueous/Solid	EPA 8260B, C	GC-MS	2-Chlorotoluene
Aqueous/Solid	EPA 8260B, C	GC-MS	2-Hexanone
Aqueous/Solid	EPA 8260B, C	GC-MS	4-Chlorotoluene
Aqueous/Solid	EPA 8260B, C	GC-MS	4-Isopropyltoluene
Aqueous/Solid	EPA 8260B, C	GC-MS	4-Methyl-2-pentanone (MIBK)
Aqueous/Solid	EPA 8260B, C	GC-MS	Acetone
Aqueous/Solid	EPA 8260B, C	GC-MS	Acetonitrile
Aqueous/Solid	EPA 8260B, C	GC-MS	Acrolein
Aqueous/Solid	EPA 8260B, C	GC-MS	Acrylonitrile
Aqueous/Solid	EPA 8260B, C	GC-MS	Benzene
Aqueous/Solid	EPA 8260B, C	GC-MS	Bromobenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	Bromochloromethane
Aqueous/Solid	EPA 8260B, C	GC-MS	Bromodichloromethane
Aqueous/Solid	EPA 8260B, C	GC-MS	Bromoform
Aqueous/Solid	EPA 8260B, C	GC-MS	Bromomethane
Aqueous/Solid	EPA 8260B, C	GC-MS	Carbon disulfide
Aqueous/Solid	EPA 8260B, C	GC-MS	Carbon Tetrachloride
Aqueous/Solid	EPA 8260B, C	GC-MS	Chlorobenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	Chlorodibromomethane
Aqueous/Solid	EPA 8260B, C	GC-MS	Chloroethane
Aqueous/Solid	EPA 8260B, C	GC-MS	Chloroform
Aqueous/Solid	EPA 8260B, C	GC-MS	Chloromethane
Aqueous/Solid	EPA 8260B, C	GC-MS	cis-1,2-Dichloroethene
Aqueous/Solid	EPA 8260B, C	GC-MS	cis-1,3-Dichloropropene
Aqueous/Solid	EPA 8260B, C	GC-MS	Dibromomethane
Aqueous/Solid	EPA 8260B, C	GC-MS	Dichlorodifluoromethane
Aqueous/Solid	EPA 8260B, C	GC-MS	Dichloromethane (Methylene Chloride)
Aqueous/Solid	EPA 8260B, C	GC-MS	Di-isopropylether (DIPE)
Aqueous/Solid	EPA 8260B, C	GC-MS	DIPE
Aqueous/Solid	EPA 8260B, C	GC-MS	ETBE
Aqueous/Solid	EPA 8260B, C	GC-MS	Ethyl Benzene
Aqueous/Solid	EPA 8260B, C	GC-MS	Ethylbenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	Freon 11
Aqueous/Solid	EPA 8260B, C	GC-MS	Freon 113



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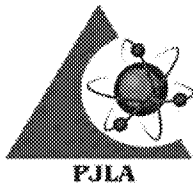
ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626
Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solid	EPA 8260B, C	GC-MS	Hexachlorobutadiene
Aqueous/Solid	EPA 8260B, C	GC-MS	Isopropylbenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	Methyl-tert-butylether (MTBE)
Aqueous/Solid	EPA 8260B, C	GC-MS	Naphthalene
Aqueous/Solid	EPA 8260B, C	GC-MS	n-Butylbenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	n-Propylbenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	sec-Butylbenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	Styrene
Aqueous/Solid	EPA 8260B, C	GC-MS	tert-amylmethylether (TAME)
Aqueous/Solid	EPA 8260B, C	GC-MS	tert-Butyl alcohol
Aqueous/Solid	EPA 8260B, C	GC-MS	tert-butylbenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	Tetrachloroethene
Aqueous/Solid	EPA 8260B, C	GC-MS	Toluene
Aqueous/Solid	EPA 8260B, C	GC-MS	trans-1,2-Dichloroethene
Aqueous/Solid	EPA 8260B, C	GC-MS	trans-1,3-Dichloropropene
Aqueous/Solid	EPA 8260B, C	GC-MS	Trichloroethene
Aqueous/Solid	EPA 8260B, C	GC-MS	Trichlorofluoromethane (Freon 11)
Aqueous/Solid	EPA 8260B, C	GC-MS	Vinyl acetate
Aqueous/Solid	EPA 8260B, C	GC-MS	Vinyl chloride
Aqueous/Solid	EPA 8260B, C	GC-MS	Xylene, total
Aqueous/Solid	EPA 8260B, C	GC-MS	1,1-Dichloroethene
Aqueous/Solid	EPA 8260B, C	GC-MS	1,1-Dichloropropene
Aqueous/Solid	EPA 8260B, C	GC-MS	1,2,3-Trichlorobenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	1,2,3-Trichloropropane
Aqueous/Solid	EPA 8260B, C	GC-MS	1,2,4-Trichlorobenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	1,2,4-Trimethylbenzene
Aqueous/Solid	EPA 8270C, D	GC-MS	1,2,4-Trichlorobenzene
Aqueous/Solid	EPA 8270C, D	GC-MS	1,2-Dichlorobenzene
Aqueous/Solid	EPA 8270C, D	GC-MS	1,3-Dichlorobenzene
Aqueous/Solid	EPA 8270C, D	GC-MS	1,4-Dichlorobenzene
Aqueous/Solid	EPA 8270C, D	GC-MS	2,4,5-Trichlorophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	2,4,6-Trichlorophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	2,4-Dichlorophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	2,4-Dimethylphenol
Aqueous/Solid	EPA 8270C, D	GC-MS	2,4-Dinitrophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	2,4-Dinitrotoluene



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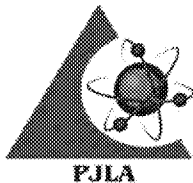
ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626
Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solid	EPA 8270C, D	GC-MS	2,6-Dinitrotoluene
Aqueous/Solid	EPA 8270C, D	GC-MS	2-Chloronaphthalene
Aqueous/Solid	EPA 8270C, D	GC-MS	2-Chlorophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	2-Methyl-4,6-Dinitrophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	2-Methylnaphthalene
Aqueous/Solid	EPA 8270C, D	GC-MS	2-Methylphenol
Aqueous/Solid	EPA 8270C, D	GC-MS	2-Nitroaniline
Aqueous/Solid	EPA 8270C, D	GC-MS	2-Nitrophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	3,3-Dichlorobenzidine
Aqueous/Solid	EPA 8270C, D	GC-MS	3-Nitroaniline
Aqueous/Solid	EPA 8270C, D	GC-MS	4-Bromophenyl-phenylether
Aqueous/Solid	EPA 8270C, D	GC-MS	4-Chloro-3-methylphenol
Aqueous/Solid	EPA 8270C, D	GC-MS	4-Chloroaniline
Aqueous/Solid	EPA 8270C, D	GC-MS	4-Chlorophenyl-phenylether
Aqueous/Solid	EPA 8270C, D	GC-MS	4-Methylphenol (and/or 3-Methylphenol)
Aqueous/Solid	EPA 8270C, D	GC-MS	4-Nitroaniline
Aqueous/Solid	EPA 8270C, D	GC-MS	4-Nitrophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	Acenaphthene
Aqueous/Solid	EPA 8270C, D	GC-MS	Acenaphthylene
Aqueous/Solid	EPA 8270C, D	GC-MS	Aniline
Aqueous/Solid	EPA 8270C, D	GC-MS	Anthracene
Aqueous/Solid	EPA 8270C, D	GC-MS	Benzidine
Aqueous/Solid	EPA 8270C, D	GC-MS	Benzo(a)anthracene
Aqueous/Solid	EPA 8270C, D	GC-MS	Benzo(a)pyrene
Aqueous/Solid	EPA 8270C, D	GC-MS	Benzo(b)fluoranthene
Aqueous/Solid	EPA 8270C, D	GC-MS	Benzo(g,h,i)perylene
Aqueous/Solid	EPA 8270C, D	GC-MS	Benzo(k)fluoranthene
Aqueous/Solid	EPA 8270C, D	GC-MS	Benzoic acid
Aqueous/Solid	EPA 8270C, D	GC-MS	Benzyl alcohol
Aqueous/Solid	EPA 8270C, D	GC-MS	bis(2-Chloroethoxy)methane
Aqueous/Solid	EPA 8270C, D	GC-MS	bis(2-Chloroethyl)ether
Aqueous/Solid	EPA 8270C, D	GC-MS	bis(2-Chloroisopropyl)ether
Aqueous/Solid	EPA 8270C, D	GC-MS	bis(2-ethylhexy)phthalate
Aqueous/Solid	EPA 8270C, D	GC-MS	Butyl benzyl phthalate
Aqueous/Solid	EPA 8270C, D	GC-MS	Carbazole
Aqueous/Solid	EPA 8270C, D	GC-MS	Chrysene



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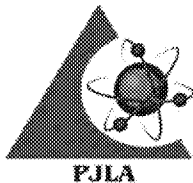
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ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626
Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solid	EPA 8270C, D	GC-MS	Dibenzo(a,h)anthracene
Aqueous/Solid	EPA 8270C, D	GC-MS	Dibenzofuran
Aqueous/Solid	EPA 8270C, D	GC-MS	Diethyl phthalate
Aqueous/Solid	EPA 8270C, D	GC-MS	Dimethylphthalate
Aqueous/Solid	EPA 8270C, D	GC-MS	di-n-butylphthalate
Aqueous/Solid	EPA 8270C, D	GC-MS	Di-n-octylphthalate
Aqueous/Solid	EPA 8270C, D	GC-MS	Fluoranthene
Aqueous/Solid	EPA 8270C, D	GC-MS	Fluorene
Aqueous/Solid	EPA 8270C, D	GC-MS	Hexachlorobenzene
Aqueous/Solid	EPA 8270C, D	GC-MS	Hexachlorobutadiene
Aqueous/Solid	EPA 8270C, D	GC-MS	Hexachlorocyclopentadiene
Aqueous/Solid	EPA 8270C, D	GC-MS	Hexachloroethane
Aqueous/Solid	EPA 8270C, D	GC-MS	Indeno(1,2,3, cd)pyrene
Aqueous/Solid	EPA 8270C, D	GC-MS	Isophorone
Aqueous/Solid	EPA 8270C, D	GC-MS	Naphthalene
Aqueous/Solid	EPA 8270C, D	GC-MS	Nitrobenzene
Aqueous/Solid	EPA 8270C, D	GC-MS	N-Nitrosodimethylamine
Aqueous/Solid	EPA 8270C, D	GC-MS	N-Nitroso-di-n-propylamine
Aqueous/Solid	EPA 8270C, D	GC-MS	N-Nitrosodiphenylamine
Aqueous/Solid	EPA 8270C, D	GC-MS	Pentachlorobenzene
Aqueous/Solid	EPA 8270C, D	GC-MS	Pentachlorophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	Phenanthrene
Aqueous/Solid	EPA 8270C, D	GC-MS	Phenol
Aqueous/Solid	EPA 8270C, D	GC-MS	Pyrene
Aqueous/Solid	EPA 8270C, D	GC-MS	Pyridine
Aqueous/Solid	EPA 8270C, D	GC-MS	2,3,4,6-Tetrachlorophenol
Aqueous/Solid	EPA 8270C,D	GC-MS	1,2,4,5-Tetrachlorobenzene
Aqueous/Solid	EPA 8270 SIM	GC-MS	2-Methylnaphthalene
Aqueous/Solid	EPA 8270 SIM	GC-MS	Acenaphthene
Aqueous/Solid	EPA 8270 SIM	GC-MS	Acenaphthylene
Aqueous/Solid	EPA 8270 SIM	GC-MS	Anthracene
Aqueous/Solid	EPA 8270 SIM	GC-MS	Benzo(a)anthracene
Aqueous/Solid	EPA 8270 SIM	GC-MS	Benzo(a)pyrene
Aqueous/Solid	EPA 8270 SIM	GC-MS	Benzo(b)fluoranthene
Aqueous/Solid	EPA 8270 SIM	GC-MS	Benzo(g,h,i)perylene
Aqueous/Solid	EPA 8270 SIM	GC-MS	Benzo(k)fluoranthene



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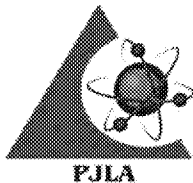
ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626
Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solid	EPA 8270 SIM	GC-MS	Chrysene
Aqueous/Solid	EPA 8270 SIM	GC-MS	Dibenzo(a,h)anthracene
Aqueous/Solid	EPA 8270 SIM	GC-MS	Fluoranthene
Aqueous/Solid	EPA 8270 SIM	GC-MS	Fluorene
Aqueous/Solid	EPA 8270 SIM	GC-MS	Indeno(1,2,3, cd)pyrene
Aqueous/Solid	EPA 8270 SIM	GC-MS	Naphthalene
Aqueous/Solid	EPA 8270 SIM	GC-MS	PBDE 100
Aqueous/Solid	EPA 8270 SIM	GC-MS	PBDE 128
Aqueous/Solid	EPA 8270 SIM	GC-MS	PBDE 138
Aqueous/Solid	EPA 8270 SIM	GC-MS	PBDE 153
Aqueous/Solid	EPA 8270 SIM	GC-MS	PBDE 154
Aqueous/Solid	EPA 8270 SIM	GC-MS	PBDE 17
Aqueous/Solid	EPA 8270 SIM	GC-MS	PBDE 183
Aqueous/Solid	EPA 8270 SIM	GC-MS	PBDE 190
Aqueous/Solid	EPA 8270 SIM	GC-MS	PBDE 203
Aqueous/Solid	EPA 8270 SIM	GC-MS	PBDE 206
Aqueous/Solid	EPA 8270 SIM	GC-MS	PBDE 209
Aqueous/Solid	EPA 8270 SIM	GC-MS	PBDE 28
Aqueous/Solid	EPA 8270 SIM	GC-MS	PBDE 47
Aqueous/Solid	EPA 8270 SIM	GC-MS	PBDE 66
Aqueous/Solid	EPA 8270 SIM	GC-MS	PBDE 71
Aqueous/Solid	EPA 8270 SIM	GC-MS	PBDE 85
Aqueous/Solid	EPA 8270 SIM	GC-MS	PBDE 99
Aqueous/Solid	EPA 8270 SIM	GC-MS	p-Dioxane
Aqueous/Solid	EPA 8270 SIM	GC-MS	Phenanthrene
Aqueous/Solid	EPA 8270 SIM	GC-MS	Pyrene
Aqueous/Solid	EPA 8330B	HPLC	1,3,5-Trinitrobenzene
Aqueous/Solid	EPA 8330B	HPLC	1,3-Dinitrobenzene
Aqueous/Solid	EPA 8330B	HPLC	2,4,6-Trinitrotoluene
Aqueous/Solid	EPA 8330B	HPLC	2,4-Dinitrotoluene
Aqueous/Solid	EPA 8330B	HPLC	2,6-Dinitrotoluene
Aqueous/Solid	EPA 8330B	HPLC	2-Amino-4,6-dinitrotoluene
Aqueous/Solid	EPA 8330B	HPLC	2-Nitrotoluene
Aqueous/Solid	EPA 8330B	HPLC	3,5-Dinitroaniline
Aqueous/Solid	EPA 8330B	HPLC	3-Nitrotoluene
Aqueous/Solid	EPA 8330B	HPLC	4-Amino-2,6-dinitrotoluene



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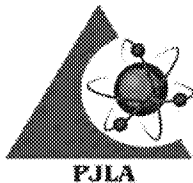
ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626
Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solid	EPA 8330B	HPLC	4-Nitrotoluene
Aqueous/Solid	EPA 8330B	HPLC	HMX (octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine)
Aqueous/Solid	EPA 8330B	HPLC	Nitrobenzene
Aqueous/Solid	EPA 8330B	HPLC	Nitroglycerin
Aqueous/Solid	EPA 8330B	HPLC	Pentachloronitrobenzene
Aqueous/Solid	EPA 8330B	HPLC	Pentaerythritoltetranitrate
Aqueous/Solid	EPA 8330B	HPLC	RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)
Aqueous/Solid	EPA 8330B	HPLC	Tetryl (methyl-2,4,6-trinitrophenylnitramine)
Aqueous/Solid	EPA 9012B	Colorimetry	Total Cyanide
Aqueous/Solid	EPA 9030B	Distillation Unit	Sulfide
Aqueous/Solid	EPA 9056A	IC	Bromide
Aqueous/Solid	EPA 9056A	IC	Chloride
Aqueous/Solid	EPA 9056A	IC	Fluoride
Aqueous/Solid	EPA 9056A	IC	Sulfate
Aqueous/Solid	EPA 9065	Spectrophotometer	Total Phenolics
Aqueous/Solid	LCP-NITG	HPLC/UV	Nitroguanidine
Aqueous/Solid	NWTPH-Dx	GC-FID	Residual Range Organics
Aqueous/Solid	OPPMS2	GC/MS/MS	Azinphos-methyl (Guthion)
Aqueous/Solid	OPPMS2	GC/MS/MS	Chlorpyrifos
Aqueous/Solid	OPPMS2	GC/MS/MS	Demeton O & S
Aqueous/Solid	OPPMS2	GC/MS/MS	Diazinon
Aqueous/Solid	OPPMS2	GC/MS/MS	Dichlorvos
Aqueous/Solid	OPPMS2	GC/MS/MS	dimethoate
Aqueous/Solid	OPPMS2	GC/MS/MS	Disulfoton
Aqueous/Solid	OPPMS2	GC/MS/MS	Ethoprop
Aqueous/Solid	OPPMS2	GC/MS/MS	Parathion, ethyl
Aqueous/Solid	OPPMS2	GC/MS/MS	Parathion, methyl
Aqueous/Solid	OPPMS2	GC/MS/MS	Phorate
Aqueous/Solid	OPPMS2	GC/MS/MS	Ronnel
Aqueous/Solid	OPPMS2	GC/MS/MS	Stirophos
Aqueous/Solid	OPPMS2	GC/MS/MS	Sulfotepp
Aqueous/Solid	SM4500 NH3 G	Colorimetry	Ammonia
Aqueous/Solid	SOC-Butyl	GC-FPD	Di-n-butyltin
Aqueous/Solid	SOC-Butyl	GC-FPD	n-Butyltin
Aqueous/Solid	SOC-Butyl	GC-FPD	Tetra-n-butyltin



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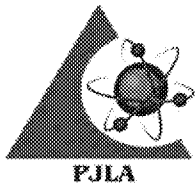
ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626

Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solid	SOC-Butyl	GC-FPD	Tri-n-butyltin
Aqueous/Solid	SOC-OTTO	GC-ECD	Otto Fuel
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Aldrin
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Alpha-BHC
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	beta-BHC
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	DDD (4,4)
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	DDE (4,4)
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	DDT (4,4)
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	delta-BHC
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Dieldrin
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Endosulfan I
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Endosulfan II
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Endosulfan sulfate
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Endrin
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Endrin aldehyde
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Endrin ketone
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	gamma-BHC
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Heptachlor
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Heptachlor Epoxide (beta)
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Methoxychlor
Aqueous/Solid	SOP-LCP-PFC	HPLC/MS/MS	Perfluorobutane sulfonate
Aqueous/Solid	SOP-LCP-PFC	HPLC/MS/MS	Perfluorobutanoic acid
Aqueous/Solid	SOP-LCP-PFC	HPLC/MS/MS	Perfluorodecane Sulfonate
Aqueous/Solid	SOP-LCP-PFC	HPLC/MS/MS	Perfluorodecanoic acid
Aqueous/Solid	SOP-LCP-PFC	HPLC/MS/MS	Perfluorododecanoic acid
Aqueous/Solid	SOP-LCP-PFC	HPLC/MS/MS	Perfluoroheptanoic acid
Aqueous/Solid	SOP-LCP-PFC	HPLC/MS/MS	Perfluorohexane sulfonate
Aqueous/Solid	SOP-LCP-PFC	HPLC/MS/MS	Perfluorohexanoic acid
Aqueous/Solid	SOP-LCP-PFC	HPLC/MS/MS	Perfluorononanoic acid
Aqueous/Solid	SOP-LCP-PFC	HPLC/MS/MS	Perfluorooctane sulfonate
Aqueous/Solid	SOP-LCP-PFC	HPLC/MS/MS	Perfluorooctanoic acid
Aqueous/Solid	SOP-LCP-PFC	HPLC/MS/MS	Perfluoropentanoic acid
Aqueous/Solid	SOP-LCP-PFC	HPLC/MS/MS	Perfluoroundecanoic acid



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ALS Environmental-Kelso
1317 South 13th Avenue, Kelso, WA 98626
Contact Name: Carl Degner Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous	EPA 1640	Reductive Metals Precipitation	Prep Method
Aqueous	EPA 3010A	Acid Digestion	Metals Digestion
Aqueous	EPA 3020A	Acid Digestion	Metals Digestion
Aqueous	EPA 3520C	Continuous Liquid-Liquid Extraction	Extractable Prep
Aqueous	EPA 3535A	Solid Phase Extraction	Prep Method
Aqueous	EPA 5030B	Purge and Trap for Volatiles	Volatile Prep
Aqueous	SOP-MET-DIG	Acid Digestion	Metals Digestion
Solid	EPA 3050B	Acid Digestion	Metals Digestion
Solid	EPA 3060	Alkaline Digestion for Cr(VI)	Alkaline Digestion for Cr(VI) only
Solid	EPA 3541	Automated Soxhlet Extraction	Extractable Prep
Solid	EPA 3550B	Ultrasonic Extraction	Extractable Prep
Solid	EPA 5035A	Purge and Trap for Volatiles	Voc Organics
Solid	EPA 5050	Bomb Digestion	Prep Method
Solid	EPA 9013	Midi-Distillation	Cyanides
Solid	SOP-GEN-AVS	Acid Digestion	Simultaneously Extracted Metals
Aqueous/Solids	ASTM D3590-89	Digestion	TKN
Aqueous/Solids	EPA 1311	TCLP Extraction	Physical Extraction
Aqueous/Solids	EPA 3620C	Florisil clean up	Extractable Cleanup
Aqueous/Solids	EPA 3630C	Silica gel clean up	Extractable Prep
Aqueous/Solids	EPA 3640A	Gel-Permeation Clean-up	Extractable Cleanup
Aqueous/Solids	EPA 3660	Sulfur Clean-up	Extractable Prep
Aqueous/Solids	EPA 3665A	Acid clean up	Extractable Cleanup

THE STATE OF ALASKA

Department of Environmental Conservation

Laboratory Approval Program

Scope of Approval

Expiration: 06/12/2017

ALS Environmental-Kelso, WA UST-040
1317 S 13th Avenue
Kelso, WA 98626

is approved by the State of Alaska Department of Environmental Conservation, pursuant to 18 AAC 78, to perform analysis for the parameters listed below using the analytical methods indicated. Approval for all parameters is final. Approval is for the latest version of a method unless specified otherwise in a note. EPA refers to the U.S. Environmental Protection Agency. AK refers to Alaska Methods 101, 102 and 103 for the determination of gasoline, diesel and residual range organics in soil and water. ASTM refers to the American Society for Testing and Materials.

Contaminated Sites				
Method/Test Name	Reference	Analyte	Matrix	Status
6010C	EPA	Total Arsenic	Soil	Approved
6010C	EPA	Total Barium	Soil	Approved
6010C	EPA	Total Cadmium	Soil	Approved
6010C	EPA	Total Chromium	Soil	Approved
6010C	EPA	Total Lead	Soil	Approved
6010C	EPA	Total Nickel	Soil	Approved
6010C	EPA	Total Vanadium	Soil	Approved
6010C	EPA	Total Arsenic	Water	Approved
6010C	EPA	Total Barium	Water	Approved
6010C	EPA	Total Cadmium	Water	Approved
6010C	EPA	Total Chromium	Water	Approved
6010C	EPA	Total Lead	Water	Approved
6010C	EPA	Total Nickel	Water	Approved
6010C	EPA	Total Vanadium	Water	Approved
6020A	EPA	Total Arsenic	Soil	Approved
6020A	EPA	Total Barium	Soil	Approved
6020A	EPA	Total Cadmium	Soil	Approved
6020A	EPA	Total Chromium	Soil	Approved
6020A	EPA	Total Lead	Soil	Approved

Contaminated Sites

Method/Test Name	Reference	Analyte	Matrix	Status
6020A	EPA	Total Nickel	Soil	Approved
6020A	EPA	Total Vanadium	Soil	Approved
6020A	EPA	Total Arsenic	Water	Approved
6020A	EPA	Total Barium	Water	Approved
6020A	EPA	Total Cadmium	Water	Approved
6020A	EPA	Total Chromium	Water	Approved
6020A	EPA	Total Lead	Water	Approved
6020A	EPA	Total Nickel	Water	Approved
6020A	EPA	Total Vanadium	Water	Approved
8082A	EPA	Polychlorinated Biphenyls-PCB	Soil	Approved
8082A	EPA	Polychlorinated Biphenyls-PCB	Water	Approved
8260C	EPA	BTEX	Soil	Approved
8260C	EPA	Total Volatile Chlorinated Solvents	Soil	Approved
8260C	EPA	BTEX	Water	Approved
8260C	EPA	Total Volatile Chlorinated Solvents	Water	Approved
8270D	EPA	PAH	Soil	Approved
8270D	EPA	PAH	Water	Approved
AK101	AK	Gasoline Range Organics	Soil	Approved
AK101	AK	Gasoline Range Organics	Water	Approved
AK102	AK	Diesel Range Organics	Soil	Approved
AK102	AK	Diesel Range Organics	Water	Approved
AK102-SV	AK	Diesel Range Organics-small volume	Water	Approved
AK103	AK	Residual Range Organics	Soil	Approved



CERTIFICATE OF ACCREDITATION

ANSI-ASQ National Accreditation Board

500 Montgomery Street, Suite 625, Alexandria, VA 22314, 877-344-3044

This is to certify that

ALS Environmental – Salt Lake City

960 West LeVoy Drive

Salt Lake City, UT 84123

has been assessed by ANAB
and meets the requirements of

ISO/IEC 17025:2005 and DoD-ELAP

while demonstrating technical competence in the field(s) of

TESTING

Refer to the accompanying Scope(s) of Accreditation for information regarding the types of tests to which this accreditation applies.

ADE - 1420

Certificate Number

ANAB Approval

Certificate Valid To: 11/25/2017

Version No. 002

Issued: 10/23/2015



This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated January 2009*).

ED_001691B_00019845



ANSI-ASQ National Accreditation Board

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005 & DoD-ELAP

ALS Environmental – Salt Lake City

960 West LeVoy Drive, Salt Lake City, UT 84123
 Robert P. Di Rienzo Phone: 801-266-7700
 Bob.DiRienzo@ALSGlobal.com www.datachem.com

TESTING

Valid to: November 25, 2017

Certificate Number: ADE- 1420

I. Chemical

MATRIX	SPECIFIC TEST or GROUP OF ANALYTES**	SPECIFICATION OR STANDARD METHOD (all EPA unless specified)	* KEY EQUIPMENT OR TECHNOLOGY USED
Dietary Supplements	Dietary Supplements and Residues	DS-OR-LC-UV-MS, USP	HPLC LC-MS
Dietary Supplements	Dietary Supplements and Residues	DS-OR-GCMS-SVOL, USP	GC-MS
Dietary Supplements	Elements and Metals Residues	DS-IN-ICP, DS-IN-ICP-MS, USP	ICP ICP-MS
Dietary Supplements	Dietary Supplements and Residues	DS-OR-IC, USP	IC
Dietary Supplements	Mercury Residues	DS-IN-HG, USP	CVAA
Toys, Lead Paint	Lead	IN AN 021/3050 6010C	ICP
CPSC - CH - E1003 - 09.1 Toys Lead Paint	Lead	IN AN 021/3050 6010C	ICP
CPSC-CH-C1001-09.3 Phthalates in Toys	Phthalates	OE-SW-3550, OS-SW-8270D – Appendix D	GC/MS
CPSC-CH-C1001-09.3 Phthalates in Plastic and Packaging	Phthalates	OE-SW-3550, OS-SW-8270D – Appendix D	GC/MS



MATRIX	SPECIFIC TEST or GROUP OF ANALYTES**	SPECIFICATION OR STANDARD METHOD (all EPA unless specified)	* KEY EQUIPMENT OR TECHNOLOGY USED
<p>Children's Metal Jewelry, (CPSC Test Method CPSC-CH-E1001-08 for Determining Total Lead)</p> <p>Children's Metal Products, (CPSC Test Method CPSC-CH-E1001-08 for Determining Total Lead in Children's Metal Products)</p> <p>Non-Metal Children's Products, (CPSC Test Method CPSC-CH-E1002-08 Standard Operating Procedure for Determining Total Lead (Pb) in Non-Metal Children's Products)</p>	Lead	IN AN 021/3050 6010C	ICP

II. Environmental

MATRIX	SPECIFIC TEST or GROUP OF ANALYTES**	SPECIFICATION OR STANDARD METHOD (all EPA unless specified)	* KEY EQUIPMENT OR TECHNOLOGY USED
Water / Solid & Hazardous Waste	Volatiles	8260 5030	GC/MS Purge and Trap
Water / Solid & Hazardous Waste	Pesticides	8081	GC/ECD
Water / Solid & Hazardous Waste	PCBs	8082	GC/ECD
Water / Solid & Hazardous Waste	Herbicides	8151	GC/ECD
Water / Solid & Hazardous Waste	Semivolatiles	8270	GC/MS
Water / Solid & Hazardous Waste	Diesel Range Organics	8015	GC/FID
Water / Solid & Hazardous Waste	Residual Range Organics	8015	GC/FID
Solid & Hazardous Waste	GPC	3640	GPC



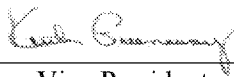
MATRIX	SPECIFIC TEST or GROUP OF ANALYTES**	SPECIFICATION OR STANDARD METHOD (all EPA unless specified)	* KEY EQUIPMENT OR TECHNOLOGY USED
Water / Solid & Hazardous Waste	Volatiles Prep	5035	Closed System Purge and Trap
Water / Solid & Hazardous Waste	TCLP	1311	Leaching Procedure
Water / Solid & Hazardous Waste	SPLP	1312	Leaching Procedure
Water / Solid & Hazardous Waste	Anions	9056	IC
Water / Solid & Hazardous Waste	Hexavalent Chromium	7196	UV/VIS
Water / Solid & Hazardous Waste	Sulfide	9030 9034	Titration
Water / Solid & Hazardous Waste	pH	9040 9045	pH Meter
Water / Solid & Hazardous Waste	Total Cyanide	9012	UV/VIS
Water / Solid & Hazardous Waste	Metals	6010	ICP
Water / Solid & Hazardous Waste	Metals	6020	ICP/MS
Water / Solid & Hazardous Waste	Mercury	7470 7471	CVAA
Water	Metals Prep	3010	Hot Block
Solid & Hazardous Waste	Metals Prep	3050	Hot Block
Water	Explosives	8330B	LC/UV or LC/MS/MS
Solid & Hazardous Waste	Explosives	8330B ¹	LC/UV or LC/MS/MS
Water	Organics Prep	3510	Liquid/Liquid Extraction



MATRIX	SPECIFIC TEST or GROUP OF ANALYTES**	SPECIFICATION OR STANDARD METHOD (all EPA unless specified)	* KEY EQUIPMENT OR TECHNOLOGY USED
Solid & Hazardous Waste	Organics Prep	3550	Sonic Disruptor
Solid & Hazardous Waste	Organics Prep	3580	Waste Dilution
Water / Solid & Hazardous Waste	Agent Degradation Products	LC-MS-AgentDegr**	LC/MS
Water / Solid & Hazardous Waste	Agent Degradation Products	OS-SW-8270D Appendix B, OE-SW-3510, OE-SW-3550**	GC/MS
Water / Solid & Hazardous Waste	Perchlorate	6850**	LC/MS
Water / Solid & Hazardous Waste	White Phosphorus	7580**	GC/FPD
Air	Volatiles	TO-15	GC/MS

Notes:

- * = As Applicable
- ** = These tests are accredited to the requirements of the DoD Environmental Laboratory Accreditation Program as defined in the DoD QSM V5.0. Refer to Accredited Analyte Listing for specific analytes in which the laboratory is accredited
- ¹ = Does not perform Incremental Sampling Methods
- This scope is formatted as part of a single document including the Certificate of Accreditation No. ADE- 1420



Vice President



DoD ELAP Accredited Analytes/Methods (by matrix)								
ALS Environmental								
Salt Lake City, Utah								
NELAC Code	Analyte							
		Non-Potable Water			Soil and Chemical Waste			Air
	Misc Analytes							
1895	Perchlorate	6850			6850			
	White Phosphorus	7580			7580			
	GC/MS Agent Degradation Products							
9546	1,4-Dithiane	8270/3510			8270/3550			
9551	1,4-Oxathiane	8270/3510			8270/3550			
	LC/MS Agent Degradation Products							
	Fluoroacetic Acid	In House LC/MS			In House LC/MS			
	Chloroacetic Acid	In House LC/MS			In House LC/MS			
	Methyl Phosphonic Acid (MPA)	In House LC/MS			In House LC/MS			
	Ethyl Methyl Phosphonic Acid (EMPA)	In House LC/MS			In House LC/MS			
	Isopropyl Methyl Phosphonic Acid (IMPA)	In House LC/MS			In House LC/MS			
	Thiodiglycol	In House LC/MS			In House LC/MS			
	Dimethyl methyl Phosphonate (DMMP)	In House LC/MS			In House LC/MS			
	Diisopropyl methyl Phosphonate (DIMP)	In House LC/MS			In House LC/MS			

APPENDIX E
Laboratory Limits

Table E1 - ALS Environmental Data Quality Objectives
Tanana River OB/OD Site (CC-FTWW-068)

METHOD	ANALYTE	MATRIX	UNITS	ADEC Cleanup Level ¹	EPA RSL ²	Background Concentrations ³	MDL	LOD	LOQ	LCS and MS %Recovery ⁴	LCS and MS %RPD ⁴
8330B	1,3,5-Trinitrobenzene	Soil	mg/kg	19	3,200	NE	0.004	0.008	0.04	80-116	20
8330B	1,3-Dinitrobenzene	Soil	mg/kg	0.02	8.2	NE	0.004	0.008	0.04	73-119	20
8330B	2,4,6-Trinitrotoluene	Soil	mg/kg	0.49	5.1	NE	0.0022	0.008	0.04	71-120	20
8330B	2,4-Dinitrotoluene	Soil	mg/kg	0.0093	7.4	NE	0.0044	0.008	0.04	75-121	20
8330B	2,6-Dinitrotoluene	Soil	mg/kg	0.0094	1.5	NE	0.0051	0.008	0.04	79-117	20
8330B	2-Amino-4,6-dinitrotoluene	Soil	mg/kg	0.029	230	NE	0.0046	0.008	0.04	71-123	20
8330B	2-Nitrotoluene	Soil	mg/kg	0.025	15	NE	0.0028	0.01	0.04	70-124	20
8330B	3,5-Dinitroaniline	Soil	mg/kg	NE	NE	NE	0.0052	0.008	0.04	86-118	20
8330B	3-Nitrotoluene	Soil	mg/kg	4.9	8.2	NE	0.0038	0.008	0.04	67-129	20
8330B	4-Amino-2,6-dinitrotoluene	Soil	mg/kg	0.029	230	NE	0.0046	0.008	0.04	64-127	20
8330B	4-Nitrotoluene	Soil	mg/kg	0.34	140	NE	0.0035	0.008	0.04	71-124	20
8330B	HMX	Soil	mg/kg	49	5,700	NE	0.0051	0.008	0.04	74-124	20
8330B	Nitrobenzene	Soil	mg/kg	0.094	22	NE	0.0038	0.008	0.04	67-129	20
8330B	Nitroglycerin	Soil	mg/kg	0.22	8.2	NE	0.053	0.08	0.2	73-124	20
8330B	PETN	Soil	mg/kg	NE	160	NE	0.053	0.08	0.2	72-128	20
8330B	RDX	Soil	mg/kg	0.04	28	NE	0.0035	0.008	0.04	67-129	20
8330B	TETRYL	Soil	mg/kg	4.5	230	NE	0.0022	0.008	0.04	68-135	20
6010C	Iron	Soil	mg/kg	NE	82,000	NE	2	4	4	81-118	20
6010C	Magnesium	Soil	mg/kg	NE	NE	NE	0.2	0.4	2	78-115	20
6010C	Strontium	Soil	mg/kg	NE	70,000	NE	0.05	0.1	0.2	83-114	20
6020A	Aluminum	Soil	mg/kg	NE	110,000	NE	0.6	2	2	78-124	20
6020A	Antimony	Soil	mg/kg	3.6	47	NE	0.02	0.05	0.05	72-124	20
6020A	Arsenic	Soil	mg/kg	3.9	3	8 ± 6	0.2	0.5	0.5	82-118	20
6020A	Barium	Soil	mg/kg	1,100	22,000	85 ± 30	0.02	0.05	0.05	86-116	20
6020A	Bismuth	Soil	mg/kg	NE	NE	NE	0.02	0.05	0.05	85-115	20
6020A	Cadmium	Soil	mg/kg	5	98	1 ± 0.8	0.009	0.02	0.02	84-116	20
6020A	Chromium	Soil	mg/kg	25	18,000	15 ± 4	0.07	0.2	0.2	83-119	20
6020A	Cobalt	Soil	mg/kg	NE	35	NE	0.009	0.02	0.02	84-115	20
6020A	Copper	Soil	mg/kg	460	4,700	NE	0.04	0.1	0.1	84-119	20
6020A	Lead	Soil	mg/kg	400	800	11 ± 15	0.02	0.05	0.05	84-118	20
6020A	Manganese	Soil	mg/kg	NE	2,600	NE	0.02	0.05	0.05	85-116	20
6020A	Nickel	Soil	mg/kg	86	2,200	NE	0.04	0.1	0.2	84-119	20
6020A	Zinc	Soil	mg/kg	86	35,000	NE	0.2	0.5	0.5	82-119	20
7471B	Mercury	Soil	mg/kg	1.4	4	NE	0.002	0.005	0.02	80-124	20
7580	White Phosphorus	Soil	mg/kg	0.036	2.3	NE	0.00015	-	0.0005 ⁵	70-141	20
6850	Perchlorate	Soil	mg/kg	0.067	82	NE	0.0017	0.005	0.005	84-121	15
AK 101	Gasoline Range Organics	Soil	mg/kg	300	NE	NE	1.5	2.5	20	60-120	20
AK 102	Diesel Range Organics	Soil	mg/kg	250	NE	NE	1.3	3.3	20	75-125	20
AK 103	Residual Range Organics	Soil	mg/kg	10,000	NE	NE	2.9	8.3	100	60-120	20
8260C-LL	1,1,1,2-Tetrachloroethane	Soil	mg/kg	NE	2.7	NE	0.00011	0.0004	0.005	78-125	20
8260C-LL	1,1,1-Trichloroethane (TCA)	Soil	mg/kg	0.82	3,600	NE	0.00011	0.0004	0.005	73-130	20

Table E1 - ALS Environmental Data Quality Objectives
Tanana River OB/OD Site (CC-FTWW-068)

METHOD	ANALYTE	MATRIX	UNITS	ADEC Cleanup Level ¹	EPA RSL ²	Background Concentrations ³	MDL	LOD	LOQ	LCS and MS %Recovery ⁴	LCS and MS %RPD ⁴
8260C-LL	1,1,2,2-Tetrachloroethane	Soil	mg/kg	0.017	2.7	NE	0.00013	0.0005	0.005	70-124	20
8260C-LL	1,1,2-Trichloroethane	Soil	mg/kg	0.018	5	NE	0.00015	0.0005	0.005	78-121	20
8260C-LL	1,1-Dichloroethane	Soil	mg/kg	25	16	NE	0.00012	0.0004	0.005	76-125	20
8260C-LL	1,1-Dichloroethene	Soil	mg/kg	0.03	100	NE	0.00025	0.0005	0.005	70-131	20
8260C-LL	1,1-Dichloropropene	Soil	mg/kg	NE	NE	NE	0.00013	0.0005	0.005	76-125	20
8260C-LL	1,2,3-Trichlorobenzene	Soil	mg/kg	NE	93	NE	0.00019	0.0005	0.02	66-130	20
8260C-LL	1,2,3-Trichloropropane	Soil	mg/kg	0.00053	0.11	NE	0.00045	0.0014	0.005	73-125	20
8260C-LL	1,2,4-Trichlorobenzene	Soil	mg/kg	0.85	26	NE	0.00013	0.0005	0.02	67-129	20
8260C-LL	1,2,4-Trimethylbenzene	Soil	mg/kg	23	24	NE	0.000054	0.0002	0.02	75-123	20
8260C-LL	1,2-Dibromo-3-chloropropane	Soil	mg/kg	NE	0.064	NE	0.0004	0.0014	0.02	61-132	20
8260C-LL	1,2-Dibromoethane (EDB)	Soil	mg/kg	0.00016	0.16	NE	0.000094	0.0003	0.02	78-122	20
8260C-LL	1,2-Dichlorobenzene	Soil	mg/kg	5.1	930	NE	0.000077	0.0003	0.005	78-121	20
8260C-LL	1,2-Dichloroethane (EDC)	Soil	mg/kg	0.016	2	NE	0.00007	0.0002	0.005	73-128	20
8260C-LL	1,2-Dichloropropane	Soil	mg/kg	0.018	4.4	NE	0.00013	0.0005	0.005	76-123	20
8260C-LL	1,3,5-Trimethylbenzene	Soil	mg/kg	23	1,200	NE	0.000092	0.0003	0.02	73-124	20
8260C-LL	1,3-Dichlorobenzene	Soil	mg/kg	28	NE	NE	0.000094	0.0003	0.005	77-121	20
8260C-LL	1,3-Dichloropropane	Soil	mg/kg	NE	2,300	NE	0.00012	0.0004	0.005	77-121	20
8260C-LL	1,4-Dichlorobenzene	Soil	mg/kg	0.64	11	NE	0.000086	0.0003	0.005	75-120	20
8260C-LL	2,2-Dichloropropane	Soil	mg/kg	NE	NE	NE	0.000098	0.0003	0.005	67-133	20
8260C-LL	2-Butanone (MEK)	Soil	mg/kg	59	19,000	NE	0.0009	0.001	0.02	51-148	20
8260C-LL	2-Chlorotoluene	Soil	mg/kg	NE	2,300	NE	0.00012	0.0004	0.02	75-122	20
8260C-LL	2-Hexanone	Soil	mg/kg	NE	130	NE	0.00093	0.002	0.02	53-145	20
8260C-LL	4-Chlorotoluene	Soil	mg/kg	NE	2,300	NE	0.000088	0.0004	0.02	72-124	20
8260C-LL	4-Isopropyltoluene	Soil	mg/kg	NE	NE	NE	0.000064	0.0002	0.02	73-127	20
8260C-LL	4-Methyl-2-pentanone (MIBK)	Soil	mg/kg	8.1	5,600	NE	0.0018	0.001	0.02	65-135	20
8260C-LL	Acetone	Soil	mg/kg	88	67,000	NE	0.0029	0.004	0.02	36-164	20
8260C-LL	Benzene	Soil	mg/kg	0.025	5.1	NE	0.000054	0.0002	0.005	77-121	20
8260C-LL	Bromobenzene	Soil	mg/kg	NE	180	NE	0.000088	0.0003	0.005	78-121	20
8260C-LL	Bromochloromethane	Soil	mg/kg	NE	63	NE	0.00024	0.0005	0.005	78-125	20
8260C-LL	Bromodichloromethane	Soil	mg/kg	0.044	1.3	NE	0.00016	0.0005	0.005	75-127	20
8260C-LL	Bromoform	Soil	mg/kg	0.34	86	NE	0.00014	0.0005	0.005	67-132	20
8260C-LL	Bromomethane	Soil	mg/kg	0.16	3	NE	0.0002	0.0005	0.005	53-143	20
8260C-LL	Carbon Disulfide	Soil	mg/kg	12	350	NE	0.000092	0.0003	0.005	63-132	20
8260C-LL	Carbon Tetrachloride	Soil	mg/kg	0.023	2.9	NE	0.000094	0.0003	0.005	70-135	20
8260C-LL	Chlorobenzene	Soil	mg/kg	0.63	130	NE	0.000065	0.0002	0.005	79-120	20
8260C-LL	Chloroethane	Soil	mg/kg	23	NE	NE	0.00074	0.001	0.005	59-139	20
8260C-LL	Chloroform	Soil	mg/kg	0.46	1.4	NE	0.00011	0.0004	0.005	78-123	20
8260C-LL	Chloromethane	Soil	mg/kg	0.21	46	NE	0.00018	0.0005	0.005	50-136	20
8260C-LL	cis-1,2-Dichloroethene	Soil	mg/kg	0.24	230	NE	0.00012	0.0004	0.005	77-123	20
8260C-LL	cis-1,3-Dichloropropene	Soil	mg/kg	0.033	8.2	NE	0.00013	0.0005	0.005	74-126	20
8260C-LL	Dibromochloromethane	Soil	mg/kg	0.032	3.3	NE	0.00018	0.0005	0.005	74-126	20
8260C-LL	Dibromomethane	Soil	mg/kg	1.1	9.8	NE	0.00028	0.0005	0.005	78-125	20
8260C-LL	Dichlorodifluoromethane	Soil	mg/kg	140	37	NE	0.00012	0.0004	0.005	29-149	20
8260C-LL	Ethylbenzene	Soil	mg/kg	6.9	25	NE	0.000094	0.0003	0.005	76-122	20
8260C-LL	Hexachlorobutadiene	Soil	mg/kg	0.12	5.3	NE	0.0004	0.0008	0.02	61-135	20
8260C-LL	Isopropylbenzene	Soil	mg/kg	51	990	NE	0.000081	0.0003	0.02	68-134	20

Table E1 - ALS Environmental Data Quality Objectives
Tanana River OB/OD Site (CC-FTWW-068)

METHOD	ANALYTE	MATRIX	UNITS	ADEC Cleanup Level ¹	EPA RSL ²	Background Concentrations ³	MDL	LOD	LOQ	LCS and MS %Recovery ⁴	LCS and MS %RPD ⁴
8260C-LL	Methylene Chloride	Soil	mg/kg	0.016	320	NE	0.00016	0.0005	0.01	70-128	20
8260C-LL	m,p-Xylenes	Soil	mg/kg	63 (total)	240	NE	0.0001	0.0004	0.005	77-124	20
8260C-LL	o-Xylene	Soil	mg/kg		280	NE	0.000081	0.0003	0.005	77-123	20
8260C-LL	Naphthalene	Soil	mg/kg		17	NE	0.00013	0.0005	0.02	62-129	20
8260C-LL	n-Butylbenzene	Soil	mg/kg	15	5,800	NE	0.000069	0.0002	0.02	70-128	20
8260C-LL	n-Propylbenzene	Soil	mg/kg	15	2,400	NE	0.00013	0.0005	0.02	73-125	20
8260C-LL	sec-Butylbenzene	Soil	mg/kg	12	12,000	NE	0.000074	0.0002	0.02	73-126	20
8260C-LL	Styrene	Soil	mg/kg	0.96	3,500	NE	0.00014	0.0005	0.005	76-124	20
8260C-LL	tert-Butylbenzene	Soil	mg/kg	12	12,000	NE	0.00014	0.0005	0.02	73-125	20
8260C-LL	Tetrachloroethene (PCE)	Soil	mg/kg	0.024	39	NE	0.00016	0.0005	0.005	73-128	20
8260C-LL	Toluene	Soil	mg/kg	6.5	4,700	NE	0.00015	0.0005	0.005	77-121	20
8260C-LL	trans-1,2-Dichloroethene	Soil	mg/kg	0.37	2,300	NE	0.00012	0.0004	0.005	74-125	20
8260C-LL	trans-1,3-Dichloropropene	Soil	mg/kg	0.033	8.2	NE	0.00011	0.0004	0.005	71-130	20
8260C-LL	Trichloroethene (TCE)	Soil	mg/kg	0.02	1.9	NE	0.00015	0.0005	0.005	77-123	20
8260C-LL	Trichlorofluoromethane	Soil	mg/kg	86	310	NE	0.000085	0.0003	0.005	62-140	20
8260C-LL	Vinyl Chloride	Soil	mg/kg	0.0085	1.7	NE	0.00018	0.0005	0.005	56-135	20
8270D_LL	1,2,4-Trichlorobenzene	Soil	mg/kg	0.85	26	NE	0.0026	0.005	0.01	34-118	20
8270D_LL	1,2-Dichlorobenzene	Soil	mg/kg	5.1	930	NE	0.0024	0.005	0.01	33-117	20
8270D_LL	1,3-Dichlorobenzene	Soil	mg/kg	28	NE	NE	0.0023	0.005	0.01	30-115	20
8270D_LL	1,4-Dichlorobenzene	Soil	mg/kg	0.64	11	NE	0.0025	0.005	0.01	31-115	20
8270D_LL	2,4,5-Trichlorophenol	Soil	mg/kg	67	8,200	NE	0.003	0.005	0.01	41-124	20
8270D_LL	2,4,6-Trichlorophenol	Soil	mg/kg	1.4	82	NE	0.003	0.005	0.01	39-126	20
8270D_LL	2,4-Dichlorophenol	Soil	mg/kg	1.3	250	NE	0.0026	0.005	0.01	10-122	20
8270D_LL	2,4-Dimethylphenol	Soil	mg/kg	8.8	1,600	NE	0.0063	0.015	0.05	30-127	20
8270D_LL	2,4-Dinitrophenol	Soil	mg/kg	0.54	160	NE	0.029	0.2	0.2	10-91	20
8270D_LL	2,4-Dinitrotoluene	Soil	mg/kg	0.0093	7.4	NE	0.0025	0.005	0.05	48-126	20
8270D_LL	2,6-Dinitrotoluene	Soil	mg/kg	0.0094	1.5	NE	0.0029	0.005	0.01	46-124	20
8270D_LL	2-Chloronaphthalene	Soil	mg/kg	120	6,000	NE	0.0032	0.005	0.01	41-114	20
8270D_LL	2-Chlorophenol	Soil	mg/kg	1.5	580	NE	0.003	0.005	0.01	34-121	20
8270D_LL	2-Methyl-4,6-dinitrophenol	Soil	mg/kg	NE	6.6	NE	0.039	0.05	0.2	23-99	20
8270D_LL	2-Methylnaphthalene	Soil	mg/kg	6.1	300	NE	0.028	0.2	0.2	38-122	20
8270D_LL	2-Methylphenol	Soil	mg/kg	15	4,100	NE	0.0041	0.0075	0.01	32-122	20
8270D_LL	2-Nitroaniline	Soil	mg/kg	NE	800	NE	0.0033	0.01	0.02	44-127	20
8270D_LL	2-Nitrophenol	Soil	mg/kg	NE	NE	NE	0.004	0.0075	0.03	36-123	20
8270D_LL	3,3'-Dichlorobenzidine	Soil	mg/kg	0.19	5.1	NE	0.0041	0.01	0.1	22-121	20
8270D_LL	3-Nitroaniline	Soil	mg/kg	NE	NE	NE	0.0044	0.02	0.02	33-119	20
8270D_LL	4-Bromophenyl Phenyl Ether	Soil	mg/kg	NE	NE	NE	0.0031	0.005	0.01	46-124	20
8270D_LL	4-Chloro-3-methylphenol	Soil	mg/kg	NE	8,200	NE	0.0029	0.005	0.01	45-122	20
8270D_LL	4-Chloroaniline	Soil	mg/kg	0.057	11	NE	0.0026	0.01	0.03	30-86	20
8270D_LL	4-Chlorophenyl Phenyl Ether	Soil	mg/kg	NE	NE	NE	0.0032	0.005	0.01	45-121	20
8270D_LL	4-Methylphenol	Soil	mg/kg	1.5	8,200	NE	0.0045	0.0075	0.01	42-126	20
8270D_LL	4-Nitroaniline	Soil	mg/kg	NE	110	NE	0.0038	0.02	0.02	37-104	20
8270D_LL	4-Nitrophenol	Soil	mg/kg	NE	NE	NE	0.0077	0.05	0.1	34-103	20
8270D_LL	Acenaphthene	Soil	mg/kg	180	4,500	NE	0.0032	0.005	0.01	40-123	20
8270D_LL	Acenaphthylene	Soil	mg/kg	180	NE	NE	0.0026	0.005	0.01	32-132	20

Table E1 - ALS Environmental Data Quality Objectives
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METHOD	ANALYTE	MATRIX	UNITS	ADEC Cleanup Level ¹	EPA RSL ²	Background Concentrations ³	MDL	LOD	LOQ	LCS and MS %Recovery ⁴	LCS and MS %RPD ⁴
8270D_LL	Anthracene	Soil	mg/kg	3,000	23,000	NE	0.0032	0.005	0.01	47-123	20
8270D_LL	Benz(a)anthracene	Soil	mg/kg	3.6	2.9	NE	0.0036	0.005	0.01	49-126	20
8270D_LL	Benzo(a)pyrene	Soil	mg/kg	0.49	0.29	NE	0.0036	0.005	0.01	45-129	20
8270D_LL	Benzo(b)fluoranthene	Soil	mg/kg	4.9	2.9	NE	0.0034	0.005	0.01	45-132	20
8270D_LL	Benzo(g,h,i)perylene	Soil	mg/kg	1,400	NE	NE	0.0037	0.005	0.01	43-134	20
8270D_LL	Benzo(k)fluoranthene	Soil	mg/kg	49	29	NE	0.004	0.005	0.01	47-132	20
8270D_LL	Benzoic Acid	Soil	mg/kg	410	330,000	NE	0.096	0.4	0.6	10-96	20
8270D_LL	Benzyl Alcohol	Soil	mg/kg	NE	8,200	NE	0.0049	0.0075	0.02	29-122	20
8270D_LL	Bis(2-chloroethoxy)methane	Soil	mg/kg	NE	250	NE	0.0028	0.0075	0.01	36-121	20
8270D_LL	Bis(2-chloroethyl) Ether	Soil	mg/kg	0.0022	250	NE	0.0031	0.0075	0.01	31-120	20
8270D_LL	Bis(2-chloroisopropyl) Ether	Soil	mg/kg	NE	22	NE	0.0028	0.0075	0.01	33-131	20
8270D_LL	Bis(2-ethylhexyl) Phthalate	Soil	mg/kg	13	160	NE	0.0089	0.01	0.1	51-133	20
8270D_LL	Butyl Benzyl Phthalate	Soil	mg/kg	920	1,200	NE	0.0037	0.005	0.01	48-132	20
8270D_LL	Chrysene	Soil	mg/kg	360	290	NE	0.0041	0.005	0.01	50-124	20
8270D_LL	Dibenz(a,h)anthracene	Soil	mg/kg	0.49	0.29	NE	0.003	0.005	0.01	45-134	20
8270D_LL	Dibenzofuran	Soil	mg/kg	11	120	NE	0.0034	0.005	0.01	44-120	20
8270D_LL	Diethyl Phthalate	Soil	mg/kg	130	66,000	NE	0.0037	0.005	0.01	48-124	20
8270D_LL	Dimethyl Phthalate	Soil	mg/kg	1,100	NE	NE	0.004	0.005	0.01	48-124	20
8270D_LL	Di-n-butyl Phthalate	Soil	mg/kg	80	8,200	NE	0.0048	0.01	0.02	51-128	20
8270D_LL	Di-n-octyl Phthalate	Soil	mg/kg	3,100	820	NE	0.0032	0.005	0.01	45-140	20
8270D_LL	Fluoranthene	Soil	mg/kg	1,400	3,000	NE	0.0037	0.005	0.01	50-127	20
8270D_LL	Fluorene	Soil	mg/kg	220	3,000	NE	0.0033	0.005	0.01	43-125	20
8270D_LL	Hexachlorobenzene	Soil	mg/kg	0.047	0.96	NE	0.0033	0.005	0.01	45-122	20
8270D_LL	Hexachlorobutadiene	Soil	mg/kg	0.12	5.3	NE	0.003	0.005	0.01	32-123	20
8270D_LL	Hexachlorocyclopentadiene	Soil	mg/kg	1.3	0.75	NE	0.004	0.05	0.05	18-71	20
8270D_LL	Hexachloroethane	Soil	mg/kg	0.21	8.0	NE	0.0025	0.005	0.01	28-117	20
8270D_LL	Indeno(1,2,3-cd)pyrene	Soil	mg/kg	4.9	2.9	NE	0.0032	0.005	0.01	45-133	20
8270D_LL	Isophorone	Soil	mg/kg	3.1	2,400	NE	0.0028	0.005	0.01	30-122	20
8270D_LL	Naphthalene	Soil	mg/kg	20	17	NE	0.0029	0.005	0.01	35-123	20
8270D_LL	Nitrobenzene	Soil	mg/kg	0.094	22	NE	0.0034	0.005	0.01	34-122	20
8270D_LL	N-Nitrosodi-n-propylamine	Soil	mg/kg	0.0011	0.33	NE	0.0033	0.0075	0.01	36-120	20
8270D_LL	N-Nitrosodiphenylamine	Soil	mg/kg	15	470	NE	0.0032	0.005	0.01	38-127	20
8270D_LL	Pentachlorophenol	Soil	mg/kg	0.047	4.0	NE	0.0053	0.05	0.1	25-133	20
8270D_LL	Phenanthrene	Soil	mg/kg	3,000	NE	NE	0.0036	0.005	0.01	50-121	20
8270D_LL	Phenol	Soil	mg/kg	68	25,000	NE	0.0031	0.005	0.01	34-121	20
8270D_LL	Pyrene	Soil	mg/kg	1,000	2,300	NE	0.0037	0.005	0.01	47-127	20
8270D_LL	Diphenylamine	Soil	mg/kg	25	2,100	NE	0.00014	-	0.01 ⁵	70-130	30
8270D_LL	N,N-Dimethylaniline	Soil	mg/kg	NE	230	NE	0.0604	-	0.33 ⁵	70-130	30
9045D	pH	Soil	pH Units	-	-	-	-	-	-	-	20
160.3 Mod	Solids, Total	Soil	%	-	-	-	-	-	-	-	20
1311/8330A	Nitrobenzene	Water	mg/L	2.0 ⁶	NE	NE	0.000013	0.00004	0.0001	65-134	30
1311/8330A	2,4-Dinitrotoluene	Water	mg/L	0.13 ⁶	NE	NE	0.000009	0.00002	0.0001	78-120	30

Table E1 - ALS Environmental Data Quality Objectives
Tanana River OB/OD Site (CC-FTWW-068)

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1311/6010C	Arsenic	Water	mg/L	5.0 ⁶	NE	NE	0.025	0.05	0.05	80-120	20
1311/6010C	Barium	Water	mg/L	100 ⁶	NE	NE	0.5	1	1	80-120	20
1311/6010C	Cadmium	Water	mg/L	1.0 ⁶	NE	NE	0.001	0.0025	0.05	80-120	20
1311/6010C	Chromium	Water	mg/L	5.0 ⁶	NE	NE	0.01	0.025	0.05	80-120	20
1311/6010C	Lead	Water	mg/L	5.0 ⁶	NE	NE	0.02	0.05	0.05	80-120	20
1311/7470A	Mercury	Water	mg/L	0.2 ⁶	NE	NE	0.0001	0.0002	0.001	80-120	20

MDLs/LODs/LOQs that exceed a cleanup level or RSL are shown in gray highlight and red font.

¹ - ADEC cleanup level is most stringent pathway in Tables B1 and B2 of 18 AAC 75.341.

² - The most stringent EPA Region 9 screening level (TR=10⁻⁶ or HI=0.1) is shown.

³ - Background metals concentrations from USARAK, 1994.

⁴ - Recovery and RPD are consistent with QSM Version 5.0, when applicable.

⁵ - LOD/LOQs have not been established; therefore, the reporting limit is shown in lieu of LOQ.

⁶ - The cleanup level listed for TCLP samples represents the maximum concentration for the toxicity characteristic under 49 CFR 261.24.

ADEC - Alaska Department of Environmental Conservation

CFR - Code of Federal Regulations

EPA - U.S. Environmental Protection Agency

HI - Noncancer Hazard Index

LCS - laboratory control sample

LOD - limit of detection

LOQ - limit of quantitation

MDL - method detection limit

MS - matrix spike

NE - not established

QSM - Quality Systems Manual for Environmental Laboratories

RPD - relative percent difference

RSL - regional screening levels

TR - Carcinogenic Target Risk

USARAK - U.S. Army Corps of Engineers, Alaska District

% - percent

APPENDIX F
Review Comments

EPA Review and Comments: Draft Final Time Critical Soil Sampling Work Plan, Post Removal Action Soil Sampling Small Arms Complex Open Burn/Open Detonation River Site, Fort Wainwright, Alaska, May 2016

Number	Page	Section	Comment	
EPA R10 received the Draft Final Time Critical Soil Sampling Work Plan, Post Removal Action Soil Sampling Small Arms Complex Open Burn/Open Detonation River Site, Fort Wainwright, Alaska, May 2016 on May 20, 2016. Overall the workplan is very good and incorporated many of EPA's comments on the September 2015 draft version. EPA agrees to a phased approach for the soil characterization effort and will evaluate the soil results prior to requiring any additional sampling. EPA comments were submitted on May 26, 2016 and are inclusive of the RCRA and CERCLA programs and the R10 munitions expert.				
1.	1-2	1.1.3	Suggestion to add subsurface to this sentence: "Based on the CRREL site evaluation, an area of approximately 0.8 acres was found to contain surficial <i>and subsurface</i> ferrous and non-ferrous MD."	Agreed. Suggested words will be added to text.
2.	1-3	1.1.3	Suggestion to add a sentence on the quantity of MEC found at the site to this paragraph to justify investigation of contaminants since more than scrap metal was found at the site. "Over 300,000 pounds of metal was recovered/recycled and approximately 2,500 cubic yards of soil has been stockpiled in varying stages of processing (U.S. Army Garrison, Alaska [USAGAK], 2015a and 2015b)."	Agreed. The list of MEC items transferred to EOD in the referenced document will be added to Work Plan text.
3.		Table 1-2	The QA/QC of sample and lab data should be performed by someone other than the person responsible for field sample collection. Utley could fill this role to review lab data QA/QC. It's unclear how his role as a USACE chemist oversees a commercial laboratory.	Agreed. Responsibility will be revised to indicate "oversight of laboratory data quality."
4.	2-1	2.1	Please add the word soil to this sentence in (). "The overall project objective is to determine if soil contamination remains following the removal actions (i.e., verify whether the TCRA has accomplished the goal	Agreed. "soil" will be added to sentence as suggested since other media will not be sampled during this effort.

Number	Page	Section	Comment	
			of removing immediate <i>soil</i> risk to human health and the environment).	
5.	2-2	2.2.1	Typo: The DU boundaries for identified on Figure 4 may need to be adjusted slightly to match the actual size of the excavation.	Agreed. Typo will be corrected.
6.		2.2.4 MI Sample Processing	Please clarify if the laboratory has their own SOP for post-sample processing of the MI samples or will be using SOP MI-1 in Appendix B. If the lab is using a separate SOP for sample processing, it should be provided with the workplan. If the lab is using SOP MI-1, the requirement for photos of any material >2 mm sieve should be added to the protocol documentation section.	Agreed. The project laboratory will be using their SOP. The FES SOP for MI processing will be replaced by the laboratory SOP. Note that the photographing of >2 mm sieve material was a special request to document that material and is not part of the laboratory SOP. This request was added to lab's project profile and will accompany the samples attached to the COC form.
7.	2-6	2.2.6	Typo: Due to the flammability properties and safety concerns regarding white phosphorus, percent solids analysis will not be <i>performed on</i> white phosphorus samples, and results will be reported on a wet weight basis.	Agreed. Missing words "performed on" will be added to text.
8.		Table 2-2	Remove White Phosphorus from the plastic bag bulk soil sample list (row 4 of table)	Agreed. Errant Row 4 will be deleted.
9.	3-4	3.3	Either delete the reference to ADEC cleanup levels or clarify how results will be compared to both screening and cleanup levels. Please clarify how the various results will be used (TCLP, screening levels, cleanup levels) for decision making. Sample results and 95% UCLs will be compared to the ADEC cleanup and screening levels.	Noted. Sentence will be revised to state that "Sample results and 95% UCLs will be compared to ADEC cleanup levels to determine if the TCRA is complete." Risk evaluation will not be conducted as part of this TCRA soil sampling effort. EPA RSLs

Number	Page	Section	Comment	
				will be used for evaluating detected contaminants only if there is no ADEC cleanup level.

Note – All references to screening levels for the purposes of risk assessment will be deleted from Work Plan, per Army request.

**REVIEW
COMMENTS**

PROJECT: Small Arms Complex, Open Burn / Open Detonation River Site
DOCUMENT: Draft Time Critical Soil Sampling Work Plan **Location:** Fort Wainwright, Alaska

U.S. ARMY CORPS OF ENGINEERS		DATE: May 25, 2016 REVIEWER: Guy Warren, ADEC PHONE: 907-269-7528	Action taken on comment by: Mike Boese (FES) 907-277-7111		
Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)

1.	Page 1-3, Table 1-1	The second and third bullet in the table are similar and it doesn't tell me much. Recommend deleting second bullet or revise with better description of PID field screening	Accepted	The second and third bullets will be combined as follows (note sampling approach was revised as per Comment #4): "All primary MI sample locations within the trenches and associated stockpile(s) will be field screened for volatile organics, and five discrete samples from each trench/stockpile will be collected from the locations with the highest screening results for laboratory analysis of Petroleum Constituents. Areas outside the trenches will also be evaluated for potential petroleum contamination; field screening samples will be collected from any MI sample cells having evidence of soil contamination and up to 5 additional discrete soil samples will be submitted for laboratory analysis of Petroleum Constituents."	
2.	Page 2-1, Sec 2.1	"The most conservative ADEC cleanup levels from Table B1 and B2 of 18 AAC 75 will be used for screening." Actually these are the Default cleanup levels. Screening levels will be 1/10 th this value. Please revise. Soil samples will also be compared to the RCRA toxicity limits for the TCLP samples. Please include in text. Do we need to state how we will be comparing the soil sample results to the various cleanup/screening results	Accepted/Noted Accepted Accepted	Sentence will be revised to indicate that soil sample results will be compared to the most conservative ADEC cleanup level listed in 18 AAC 75 Tables B1/B2 (under 40 inch Zone). Since the purpose of the sampling is to confirm the TCRA (not perform a risk assessment), soil sample results will not be compared to 1/10 th ADEC screening values. Suggested sentence will be added to text. Yes, the attached table (new Table 2-1) will be added to Section 2.1 to present how the soil	

**REVIEW
COMMENTS**

PROJECT: Small Arms Complex, Open Burn / Open Detonation River Site

DOCUMENT: Draft Time Critical Soil Sampling Work Plan Location: Fort Wainwright, Alaska

U.S. ARMY CORPS OF ENGINEERS		DATE: May 25, 2016 REVIEWER: Guy Warren, ADEC PHONE: 907-269-7528	Action taken on comment by: Mike Boese (FES) 907-277-7111		
Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)

		presented in the table? For example: RCRA toxicity is to determine if material qualifies as a hazardous waste for disposal. Lowest of EPA and ADEC to determine if cleanup is complete and to determine if soil stockpiles can remain on site vs requiring off-site disposal. Screening levels will be used to evaluate which contaminants to include in cumulative risk calculations.		sample results (including 95% UCLs when available) will be used with regards to the cleanup levels.	
3.	Page 2-6, Sec 2.2.6	Text states at end of first paragraph: " . . . percent solids analysis will not be <u>performed on</u> white phosphorous samples..... " Please include underlined in text.	Accepted	Suggested words will be added to text.	
4.	Page 2-7, Sec 2.3	<p>According to table 2-1 you are looking at approximately 557 increments. 5% of that would be 27. So you are going to do 27 PID readings and take the highest 20? Are we really concerned about petroleum/VOC/SVOC contamination outside of the trenches? How about PID field screening on a grid within the trenches with an appropriate number of laboratory samples (5 per trench). Are you observing for soil staining and olfactory during MI sampling? If so you should clearly state that observations will be made during MI sampling to prioritize locations for sampling.</p> <p>I agree we want to avoid doing PID Headspace at all 557 increment locations. However I am unsure, based on this description, exactly how this activity will be performed.</p> <p>My recommendation is to perform PID field screening on a grid in the trench locations and collect discrete samples based on elevated PID. In addition any location in the other DU's that has observation of soil staining and/or olfactory evidence (during MI sample collection) will be revisited for PID headspace and laboratory soil samples.</p>	<p>Accepted</p> <p>Accepted</p> <p>Accepted</p>	<p>Since the trenches and associated stockpile(s) have the greatest potential for petroleum contamination, the plan will be revised to indicate that field screening samples will be collected from all cells within the two trenches and associated stockpile(s). Five discrete soil samples will be submitted for laboratory analysis of petroleum analytes from the cells having the highest PID results within each trench and associated stockpile(s). As there is potential for petroleum contamination outside of the trench areas, observations will be made for potential petroleum contamination while collecting MI samples. Field screening samples will be collected from any MI sample cells having evidence of soil contamination. Up to 5 additional discrete soil samples will be submitted for laboratory analysis of petroleum contamination from locations (outside of trenches) having the highest PID results.</p>	Note that the MI table referenced in comment will now be referred to as Table 2-2.

**REVIEW
COMMENTS**

PROJECT: Small Arms Complex, Open Burn / Open Detonation River Site

DOCUMENT: Draft Time Critical Soil Sampling Work Plan Location: Fort Wainwright, Alaska

U.S. ARMY CORPS OF ENGINEERS		DATE: May 25, 2016 REVIEWER: Guy Warren, ADEC PHONE: 907-269-7528	Action taken on comment by: Mike Boese (FES) 907-277-7111		
Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)

5.	Figure 3	Please include date of aerial photography in figure	Accepted	Photograph date will be added to figure.	
6.	Page 4 of 5, Soil Samp-1	"Direct Push Dual Tube", Third sentence states: "The outer casing includes an expandable cutting <u>show</u> that guides the soil core into the inner sampling rods." Underlined word is causing confusion. Please Review and revise accordingly.	Accepted	"Show" will be changed to "Shoe"	
7.	Page 4 of 4, Table E1	Note states: "Reporting limits that exceed a cleanup <u>of</u> screening level are shown in gray highlight. Reporting limits exceeding the ADEC cleanup level are red." Underlined text should be "or". N-Nitrosodiphenylamine is highlighted in table yet both cleanup and screening are above the LOQ. It is also difficult to discuss "Reporting Limits" Without specifically identifying the column in the table you are referring to. Are "reporting limits" MDL, LOQ, or LOD? Please specify in note.	Accepted Accepted Accepted	"Of" will be changed to "or". Gray highlight will be removed from N-Nitrosodiphenylamine. Note that the LOD and LOQ for 8270D_LL analytes bis(2-chloroethyl)ether and pentachlorophenol were in excess of the ADEC cleanup level and will be changed to red and discussed in Section 3.2 in final Work Plan. "Reporting limits" in footnote will be changed to "MDL/LOD/LOQ" for clarity	

Note – All references to screening levels for the purposes of risk assessment will be deleted from Work Plan, per Army request.

Table 2-1 Soil Sample Result Comparisons and Data Use

Data	Compared to:	Use of Data
Discrete and MI Soil Sample Results (including 95% UCLs from MI samples)	ADEC Soil Cleanup Level	Determine if TCRA is complete and determine if soil stockpiles can remain onsite (versus offsite disposal).
	EPA RSL	Discussion for any detected contaminants for which ADEC cleanup levels do not exist.
	Background Metals Concentrations (Arsenic, Barium, Cadmium, Chromium, and Lead)	Determine if results are within the range of naturally occurring metals at the site.
TCLP Results (from stockpile MI samples)	RCRA Toxicity Criteria (40 CFR261.24)	Determine if stockpiled material qualifies as a hazardous waste for disposal.